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August 1949

UNITED STATES
DEPARTMENT OF THE INTERIOR
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BUREAU OF MINES
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INFORMATION CIRCULAR

A RECONNAISSANCE OF LODE MINES AND PROSPECTS IN THE BOHEMIA MINING DISTRICT, LANE AND DOUGLAS COUNTIES, OREG.

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UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

A RECONNAISSANCE OF LODE MINES AND PROSPECTS IN THE BOHEMIA MINING DISTRICT, LANE AND DOUGLAS COUNTIES, OREG.[1]

By John W. Taber[2]

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[1] The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7512."

[2] Mining engineer, Albany Branch, Mining Division, Bureau of Mines.

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INTRODUCTION AND SUMMARY

The Bohemia mining district is a small but intensely mineralized area in western Oregon. For its size, it has made a substantial although somewhat sporadic production of gold throughout a long period of years. The veins also contain lead, zinc, and copper, but in the past these metals have not been recovered in important amounts.

In reviewing the progress of mining activity in the district, an effort has been made to gather under one cover all available information on former operations, including methods of mining, production, and geology pertinent to the ore deposits, problems encountered, and other factual data that may affect future mining in the district. A special effort has been made to assemble as many maps of former workings as possible in order that these may be preserved and readily available to assist in future exploration. The data presented herein are based on brief reconnaissance examinations made during several weeks spent in the field in September 1946. These are supplemented by information obtained from various individuals actively or formerly connected with operations in the district. Only the principal properties and several of the more outstanding prospects were actually examined. Many of the older workings were inaccessible.

ACKNOWLEDGMENTS

The investigation of the Bohemia mining district was a part of the activities of the Albany (Northwestern) Branch of the Mining Division, S. H. Lorain, chief.

The chemical analyses included in this report were performed in Albany under the direction of S. M. Shelton, chief, Metallurgical Division, Albany Branch.

Production tables presented in the report were prepared by Alfred L. Ransome of the Metal Economics Division of the Bureau of Mines.

Because of inactivity and inacessibility of most of the properties in the district, many of the data presented were obtained from published and unpublished reports and from the records and knowledge of various individuals who had been connected or acquainted with former operations in the district.

A discussion of properties in the Bohemia district by Diller,[3] in 1900, supplied many data on early operations in the district. A more recent work by Callaghan and Buddington,[4] in 1938, provided a comprehensive description of regional and district geology as well as many important data on individual mines and prospects.

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[3] Diller, J. S., The Bohemia Mining Region of Western Oregon, with Notes on the Blue River Mining Region and on the Structure and Age of the Cascade Range: Geological Survey 20th Annual Report, pt. 3, 1900.

[4] Callaghan, Eugene, and Buddington, A. F., Metalliferous Mineral Deposits of the Cascade Range in Oregon: Geological Survey Bull. 893, 1938.

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Areal geology and topography of the district were mapped by A. F. Buddington, Eugene Callaghan, and H. E. Wheeler[4] in 1938.

The author is particularly indebted to Kenneth Watkins, owner of a number of the properties and one of the principal operators in recent years. Mr. Watkins furnished important records and maps, many of the details of the more recent operations, and donated his time freely as a guide to various properties in the district. Maps, records, and historical data were generously furnished by Fred J. Bartels, John C. Higgins, Ray Nelson, W. W. Elmer, and others.

LOCATION AND ACCESS

The Bohemia district is in west-central Oregon in the western foothills of the Cascade Range. It is in the Umpqua National Forest, partly in Lane County and partly in Douglas County. The principal prospects in the district are in an area of about 40 square miles, largely in T. 22 and 23 S., R. 1 and 2 E., W.M.

The district is easily accessible throughout most of the year. From Cottage Grove, Oreg., on U. S. Highway 99, the distance by road southeast to the principal mines in the district is 35 miles. The first 19 miles of the route is in the valley of the Row River, to Disston, over a good macadamized road. Disston is a small lumbering settlement near the head of the valley and at the terminus of the Oregon Pacific & Eastern Railroad, a short freight line connection with the Southern Pacific Railroad at Cottage Grove. From Disston, the route is a winding graveled road that climbs gradually from 1,125 feet above sea level at Disston to 5,175 feet at the crest of the main divide near the center of the district (fig. 1).

The road from Cottage Grove to Disston is maintained regularly by the County and is open throughout the year. The remainder of the route to the Bohemia district, although likewise county-owned, is not regularly maintained by the county. Spring repair work is usually done by the Forest Service to facilitate its own work. The rest of the burden of upkeep has been born largely by the mine operators in the district. The last 5 miles of the Bohemia road usually accumulates from one to several feet of snow during the months of November through March. Operators in the district have had to plow the snow from the section periodically as needed to make ore shipments.

HISTORY AND PRODUCTION

According to early newspaper accounts, the first discovery of gold was made in the creek gravels of Sharps Creek in 1858. In the fall of that year, Rufus Adams, William Shields, Willis Oglesby, and O. P. Adams set up a sluice box near the head of Sharps Creek, several miles west of the principal lode deposits of the district. Their work is said to have netted them a "handsome little stake." In the following year, Lyle Miller and O. P. Adams built a second set of sluice boxes on the "left-hand fork" (probably what is now called Fairview Creek). According to the newspaper account, "profits were beyond expectations." They are said to have scouted the Bohemia area but did not recognize the lode-gold deposits.

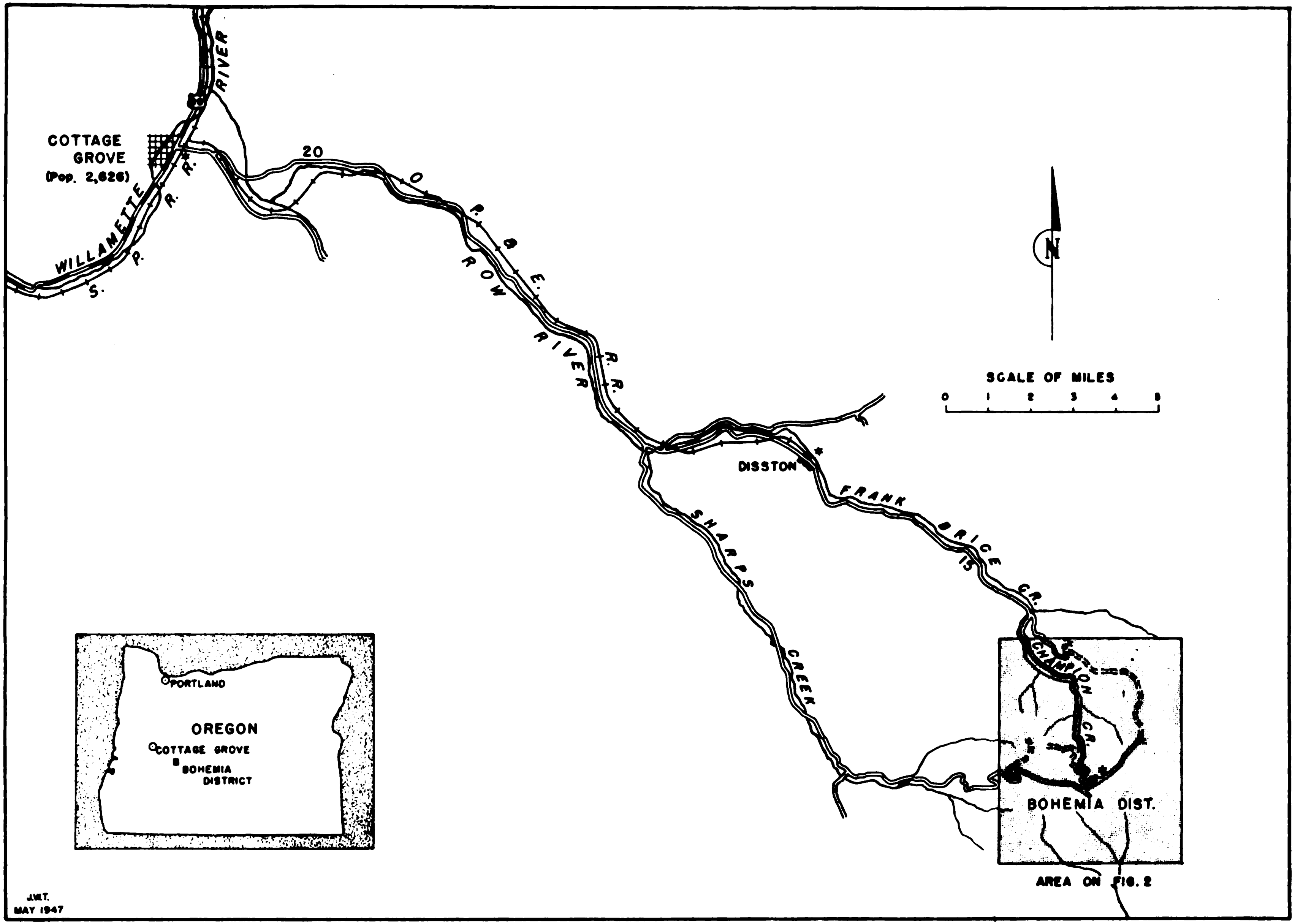

Figure 1. - Index map, Bohemia district, Lane County, Oreg.

Thereafter, no activity is reported until 1864, when James "Bohemia" Johnson and George Ramsey discovered gold in an oxidized vein outcrop on the Mystery claim at the headwaters of City Creek and about three-fourths of a mile from Bohemia Mountain. The following summer the district was flooded with prospectors. Bird Farrier discovered a second lode, which later became known as the Knott claim. Joseph Knott purchased the claim in 1872 and built a road from Red Bridge (on Sharps Creek) to the claim near the summit of Grouse Mountain. A 5-stamp mill, the first in the district, was built on the claim in 1875. This mill was operated until 1877; then it was shut down, and the district was virtually abandoned. In 1891, interest in the district was revived with the discovery of the Musick vein, the first of the larger producing veins to be found in the district. A company called the Bohemia Gold Mining & Milling Co. was formed to work the property, and the following year a 5-stamp mill, the second in the district, was erected. According to the Bohemia Nugget,[5] this mill recovered $4,000 in gold from a 9-day run on selected ore during the first season. It is said that while new development was being done the following year, this mill recovered $11,000 from the dumps.

In 1892, the Annie vein (now known as the Noonday mine) was opened. A 10-stamp mill was erected at the Champion mine in 1895, and in 1896 a 20-stamp mill was built at the Noonday mine. The Helena vein was discovered in 1896. The period from 1892 to 1907 marked the principal boom of activity in the district. During this time most of the veins were discovered and exploited for the free-milling oxide ores. In 1903, nine separate stamp mills with a total of 67 stamps were operating in the district. In 1902, the Champion, Musick, and Helena mines were acquired by the Oregon Securities Co., and a 30-stamp mill was erected at the Champion mine. These were operated until 1907. Thereafter, activity declined sharply, but some assessment work and a few small operations continued until 1930. A small cyanide mill was operated on the Evening Star claim for several years during the late 1920's. During the business depression that began in 1930 some activity in the district was aroused. Small independent operations were carried on at the Noonday, Helena, Evening Star, and Musick mines. In 1934 and 1935, small gravity and flotation mills were built at the Noonday, Helena, and Musick mines. The Noonday and Helena mills ran only a few months. The Musick mill operated for 2 years. Failure of these operations seems to have been due to inadequate financing and to failure to continue development in advance of mining.

In 1939, the Champion, Helena, Musick, and Noonday mines were leased, with options to purchase, by the H & H Mines Co. of Portland, Oreg. Considerable development was done at each of the properties, and in 1941 the company constructed a 100-ton modern selective flotation mill on the Champion property. The plan was to treat ores from the several properties in the centrally located mill. The mill started in 1942 and during that year treated 12,000 tons of ore.

Federal restrictions that prevented the company from mining the higher-grade gold ores, increasing costs, and a growing scarcity of labor forced the company to discontinue its operations in the fall of 1942. The options were allowed to lapse during the war, and control of the properties reverted to the owners.

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[5] Newspaper published in the district in the 1890's.

In 1945, at the close of the war, the owner of the Helena mine, Kenneth Watkins, began a new development program, which continued throughout 1946. Also, in 1945 Fred Bartels, owner of the Champion and Evening Star mines, began a two-man operation on small bodies of oxidized ore in the Evening Star mine. This operation continued throughout 1946. The ore from both of these operations was shipped, without concentration, to the smelter at Tacoma, Wash. These were the only operations in the district in 1946.

The recorded production for the Bohemia district is given in table 1. Although the table lists the production of metals by counties, there are no other significant mines in these counties besides those of the Bohemia district. Likewise, the combined listing of metals recovered from placer and lode operations is not significantly different from the lode production of the Bohemia district. Placer production for these counties has been practically nil, except for very small amounts of gold said to have been recovered from placer gravels in the 1860's.

The recorded production for the district is evidently considerably below the actual production. An estimate of the quantity of rock removed from stopes in the Champion, Musick, Helena, and Noonday mines, computed on the basis of incomplete stope surveys and other data, substantiates this conclusion. If the estimated total tonnage of ore removed from these stopes is valued at $11 per ton, in accordance with the over-all recovered value shown in the recorded production, the actual production of these four properties alone was probably worth about $1,000,000. This does not take into account the other properties in the district, several of which are known to have produced. The method of estimating the actual production is based upon several assumptions and therefore is not conclusive. However, it can be reasonably inferred that the actual production from the district probably was considerably more than the recorded production.

CLIMATE

The climate of the Bohemia district is essentially the same as that prevailing throughout the Willamette Valley and the Pacific slope region of the Oregon Cascades. It is persistently humid and generally mild. Usually, two or three of the summer months are fairly dry but temperate. The rest of the year is likely to be rainy. In the mountainous areas, such as the Bohemia district, much of the precipitation during the winter months is snow. In the lower parts of the district, at altitudes of 2,000 to 3,000 feet, both snow and rain are common throughout the winter months. During snowstorms, the snow may accumulate to one or more feet but rarely stays for long. At higher altitudes, where the principal mines are situated, snow usually comes early in November. Heavy snowfalls begin in December or January and sometimes accumulate to as much as 15 feet. Some snow usually remains until March or April.

Climatological observations have not been taken regularly at any point within the district. The nearest Weather Bureau recording station is at Laying Creek Ranger Station near Disston, about 17 miles from the Bohemia district. The station is about 3,000 feet lower in altitude than the principal mines in the district. Table 2 is a summary of the precipitation and snowfall recorded at the Laying Creek station.

TABLE 1

Gold, silver, copper, lead, and zinc, production in Bohemia district, Lane and Douglas Counties, Oregon, 1889-1945, in terms of recovered metal

(Compiled by Alfred L. Ransome, Metal Economics Division, Bureau of Mines)

LANE COUNTY

Year	Short tons	Gold		Silver		Copper		Lead		Zinc		Average recovered value of ore per ton 1/	Total value (lode and placer)
		Fine ounces	Value	Fine ounces	Value	Pounds	Value	Pounds	Value	Pounds	Value		
1889	—	24	$496	—	—	—	—	—	—	—	—		$496
1890	—	25	517	—	—	—	—	—	—	—	—		517
1891	—	991	20,487	—	—	—	—	—	—	—	—		20,487
1892	—	1,524	31,504	284	$247	—	—	—	—	—	—		31,751
1893	—	2,757	56,992	—	—	—	—	—	—	—	—		56,992
1894	—	1,331	27,514	—	—	—	—	—	—	—	—		27,514
1895	—	1,315	27,183	—	—	—	—	—	—	—	—		27,183
1896	—	1,016	21,003	—	—	—	—	—	—	—	—		21,003
1897-1901	No production of record												
1902	420	167	3,452	—	—	—	—	—	—	—	—	$ 82.19	3,452
1903	1,001	296	6,118	19	$10	—	—	—	—	—	—	6.12	6,128
1904	No production of record												
1905	6,100	2,232	46,140	1,024	624	—	—	—	—	—	—	7.66	46,764
1906	6,000	2,634	54,450	1,049	713	—	—	—	—	—	—	9.19	55,163
1907	7,647	1,817	37,561	727	479	—	—	—	—	—	—	4.97	38,040
1908	26	42	868	143	76	629	$83	2,138	$90	—	—	42.96	1,117
1909	2,212	636	13,147	334	173	—	—	—	—	—	—	6.02	13,320
1910	607	189	3,907	65	35	—	—	—	—	—	—	6.49	3,942
1911	4,300	1,451	29,995	447	237	—	—	—	—	—	—	7.03	30,232
1912	8,054	2,411	49,840	1,656	1,018	5,098	841	35,785	1,610	—	—	6.61	53,309
1913	1,375	290	5,995	1,604	969	7,308	1,133	59,204	2,605	—	—	7.78	10,702
1914	500	127	2,625	9	5	—	—	—	—	—	—	5.26	2,630
1915	2,142	443	9,158	57	29	406	71	5,979	281	—	—	4.45	9,539
1916	49	160	3,307	128	84	1,390	342	16,348	1,128	—	—	99.20	4,861
1917	24	96	1,984	328	270	—	—	—	—	—	—	93.91	2,254
1918	40	—	—	29	29	—	—	1,362	97	—	—	3.15	126
1919-1920	No production of record												
1921	40	48	992	232	232	—	—	—	—	—	—	30.60	1,224
1922	No production of record												
1923	200	95	1,964	43	35	—	—	—	—	—	—	9.99	1,999
1924	100	97	2,005	46	31	—	—	—	—	—	—	20.36	2,036
1925	78	63	1,302	30	21	—	—	—	—	—	—	16.96	1,323
1926	178	62	1,282	27	16	—	—	—	—	—	—	7.29	1,298
1927	No production of record												
1928	100	64	1,323	29	17	—	—	—	—	—	—	13.40	1,340
1929	15	8	165	3	2	—	—	—	—	—	—	11.13	167
1930	25	12	248	4	2	—	—	—	—	—	—	10.00	250
1931	300	243	5,023	118	34	—	—	—	—	—	—	16.85	5,057
1932	350	166	3,432	63	18	—	—	—	—	—	—	9.85	3,450
1933	120	87	2,224	150	53	—	—	401	15	—	—	19.10	2,292
1934	580	875	30,581	644	416	5,520	442	12,864	476	—	—	55.02	31,915
1935	6,772	1,451	50,785	2,980	2,142	22,413	852	63,318	2,533	—	—	8.31	56,312
1936	7,525	1,766	61,810	4,377	3,390	35,192	3,238	152,059	6,995	136,035	$6,802	10.92	82,235
1937	5,779	2,226	77,910	4,618	3,572	36,854	4,459	189,310	11,169	67,973	4,418	17.56	101,528
1938	300	6	210	2	1	—	—	—	—	—	—	0.70	211
1939	249	259	9,065	337	228	3,054	318	8,922	419	—	—	40.28	10,030
1940	14	11	385	7	5	—	—	—	—	—	—	27.85	390
1941	62	20	700	10	7	—	—	—	—	—	—	11.40	707
1942	12,442	1,105	38,675	12,716	9,062	171,455	20,746	41,548	2,784	—	—	5.72	71,267
1943-1944	No production of record												
1945	106	110	3,850	273	194	2,000	270	2,000	172	2,000	230	44.49	4,716
Total	75,832	30,748	748,174	34,642	24,476	291,319	32,795	591,238	30,374	206,008	11,450	11.17	847,269

DOUGLAS COUNTY

Year	Short tons	Gold Fine ounces	Gold Value	Silver Fine ounces	Silver Value	Copper Pounds	Copper Value	Lead Pounds	Lead Value	Zinc Pounds	Zinc Value	Average recovered value of ore per ton 1/	Total value (lode and placer)
1909	100	13	269	15	7	—	—	—	—	—	—	2.76	276
1910	800	44	910	15	8	—	—	—	—	—	—	1.14	918
1911	350	14	289	4	2	—	—	—	—	—	—	.83	291
1912	50	54	1,116	26	16	—	—	—	—	—	—	22.64	1,132
1913	No production of record												
1914	131	61	1,261	20	11	—	—	—	—	—	—	9.70	1,272
1915-1921	No production of record												
1922	—	30	620	8	8	—	—	—	—	—	—		628
Total	1,431	216	4,465	88	52	—	—	—	—	—	—		4,517
GRAND TOTAL	77,263	30,964	752,639	34,730	24,528	291,319	32,795	591,238	30,374	206,008	11,450	11.02	851,786

April 1, 1947

1/ Not to be confused with average assay value of ore.

May 20, 1947

TABLE 2. - Precipitation and snowfall, Laying Creek Ranger Station (altitude 1,200 feet)[6]

Month	Average monthly precipitation,[1] inches	Average monthly snowfall,[2] inches
January....	6.70	8.4
February...	5.79	4.0
March......	5.31	1.0
April......	4.56	.3
May........	3.31	.0
June.......	2.33	.0
July.......	3.40	.0
August.....	.49	.0
September..	2.02	.0
October....	4.02	.0
November...	6.62	.2
December...	6.86	1.4
Total...	51.41	15.3

[1] 17-year average.

[2] 24-year average.

SURFACE FEATURES

The Bohemia district is situated in the rough, maturely dissected foothills of the western slope of the Cascade Range. The district is roughly circular, centered about a sharp 5,000-foot ridge that separates the drainages of Champion and Sharps Creeks on the northwest and City and Horseheaven Creeks, tributaries of Steamboat Creek, on the southeast. The ridge around which the deposits occur is a spur of the main ridge known as the Calapooya Mountains. The spur ridge connects Bohemia Mountain, altitude 5,987 feet; Elephant Mountain, 5,522 feet; Fairview Mountain, 5,933 feet; North Fairview, 5,550 feet; Grouse Mountain, 5,570 feet; and Grizzly Mountain, 5,450 feet. These peaks are the highest in this section of the western Cascades.

The opposing headwaters of City Creek on the south and Champion Creek on the north drain from broad glacial cirques that flank the divide. The slopes are steep but retain a moderate depth of soil and loose rock. Except for a few small grassy meadows, the area is covered with fir, hemlock, and pine. The timbered portions are comparatively free from underbrush. Above 4,000 feet altitude, the timber is thin and of poor quality. At lower altitudes the quality improves, and the timber is more abundant.

GEOLOGY

General

The geology of the Bohemia district has been described in considerable detail by Callaghan and Buddington.[7] Much of the following description of the general features of the Bohemia district was condensed from data presented in their report.

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[6] Data supplied by E. S. Ellison, Sr., meteorologist in charge, U. S. Department of Commerce, Weather Bureau, Hydrologic Unit, Portland, Oreg.

[7] Work cited in footnote 4.

The principal rocks of the district are a series of bedded Tertiary volcanic rocks, a part of the more general series of extrusives that constitute most of the western Cascade range in Oregon. The beds exposed in the Bohemia district include tuffs, volcanic breccias, and andesite and rhyolite lavas. These are about equally represented in a series of beds having a total thickness of about 6,500 feet. The series is believed to be of Miocene age. The beds have a general low-angle dip to the northeast and east, although there are some local variations. The bedded rocks are cut by several nonsystematic andesite dikes. These are thought to be closely related to the extruded andesites. Other and more important intrusives are the dioritic rocks, which appear as several small plugs, dikes, and a stock. These are roughly grouped in a zone lying northwesterly across the central part of the district. Some of the diorite bodies are long and narrow; most have a certain amount of elongation. The long axes have a general west to northwesterly trend. The largest diorite body, a stock exposed by the deeply eroded floor of Champion Creek gulch, is somewhat north of the main group of westerly striking dikes. The volcanics surrounding this stock and a narrow zone extending south to the westward-trending dikes are moderately altered by contact metamorphism (fig. 2).

Vein Structure

The most outstanding features of the veins in the district are their concentration in a relatively small area and their systematic pattern. Nearly 100 veins are known in the district. At least two-thirds of these are in a compact area of less than 5 square miles. About 80 percent of the veins in the district strike between N. 45° W. and due west (fig. 2). Nearly all of the strongest veins, including those that have produced, have strikes that fall into this quadrant. The dips of the veins are mainly 60° to 70° south to southwesterly.

The northwest-striking veins are remarkably persistent. Twenty-eight separate veins have each been traced on the surface for more than 1,000 feet. Twelve of these are more than 2,000 feet long; four have been explored by prospect pits or adits for 3,000 feet or more.

The individual veins have several other features in common. The horizontal traces of the veins are often sinuous, but the over-all strike lines usually are remarkably straight. Those that have sharp breaks in strike are commonly the result of two or more fractures intersecting at low angles. Reticulating veins are found in some of the more intensely altered fractures. Several of the best producers have been of the latter type.

Another feature common to the veins in the district is the almost uniform high-angle southwesterly dip. Comparatively few of the veins have been exploited for more than 100 feet below the surface, hence there is not enough evidence to generalize on the attitude of the veins at depth. Local dip rolls are common in the Champion, Musick, and Noonday mines, but for the most part the over-all dips of these veins are fairly regular.

Ore Shoots

Knowledge of the ore shoots in the district is limited because of the few mines in which there has been systematic development below the shallow oxidized zone. Records of most of the mining are scanty. The few sketchy maps of the productive veins that are available show little more than stope outlines. These are essentially correct but are evidently incomplete in most cases.

Data from various sources have been pieced together to compose fairly comprehensive plan maps and longitudinal projections of the several developed mines of the district. The following general description of the ore shoots is based upon the data shown on the available maps, supplemented by field observations of recent development and of the accessible parts of the older workings.

The ore shoots are comparatively narrow, tabular bodies occupying fissures in both the diorite and the volcanic rocks. Exploration has not been extensive enough to ascertain whether or not there is any particular affinity of ore shoots to either of the two distinct types of country rock. None is indicated in the veins now developed.

Ore shoots of minable width commonly have a strike length of 100 feet or more, and dip lengths from 100 to as much as 350 feet. They range from a few inches to as much as 8 feet in width. Most of the ore shoots are 2 to 4 feet wide. Several shoots in the Musick mine have strike lengths of around 300 feet and dip lengths of 200 to 300 feet. These are interspersed with smaller shoots. Most of the Musick ore shoots are 2 or more feet wide; the average width is about 4 feet. The strike and dip lengths of the ore shoots in the Noonday and Helena mines are somewhat less, but the widths are more uniform. The largest shoots in the Noonday and Helena mines are about 175 feet long and about 200 feet on the dip. Their width is commonly between 3 and 4 feet. Champion ore shoots probably have greater range in size than those of other mines in the district. Stoping on the west end of the vein has been nearly continuous throughout a horizontal distance of over 300 feet and a dip distance of around 300 feet. However, the ore shoot is interrupted by numerous local pinches. Other ore shoots in the Champion are up to 300 feet in strike length but have been worked for only short distances on the dip. All are persistently narrow. Except in the oxidized zone near the surface, the best streaks in the Champion ore shoots probably average little more than 2 feet in width.

The wall rocks are commonly kaolinized and pyritized. The ore minerals are restricted almost entirely to fracture openings. Where the fracture is a single sharp-walled opening, as in much of the Champion vein, the quartz-sulfide filling is relatively narrow. Simple fractures often split into complex crushed or brecciated zones. The numerous openings thus provided are often filled with vein matter and ore minerals. These zones of complex fracturing often pinch to a single fracture with a narrow filling of vein material and again widen to another crushed zone. The best sulfide ore shoots in the district have been mainly in the lenticular crushed and reticulated parts of the veins.

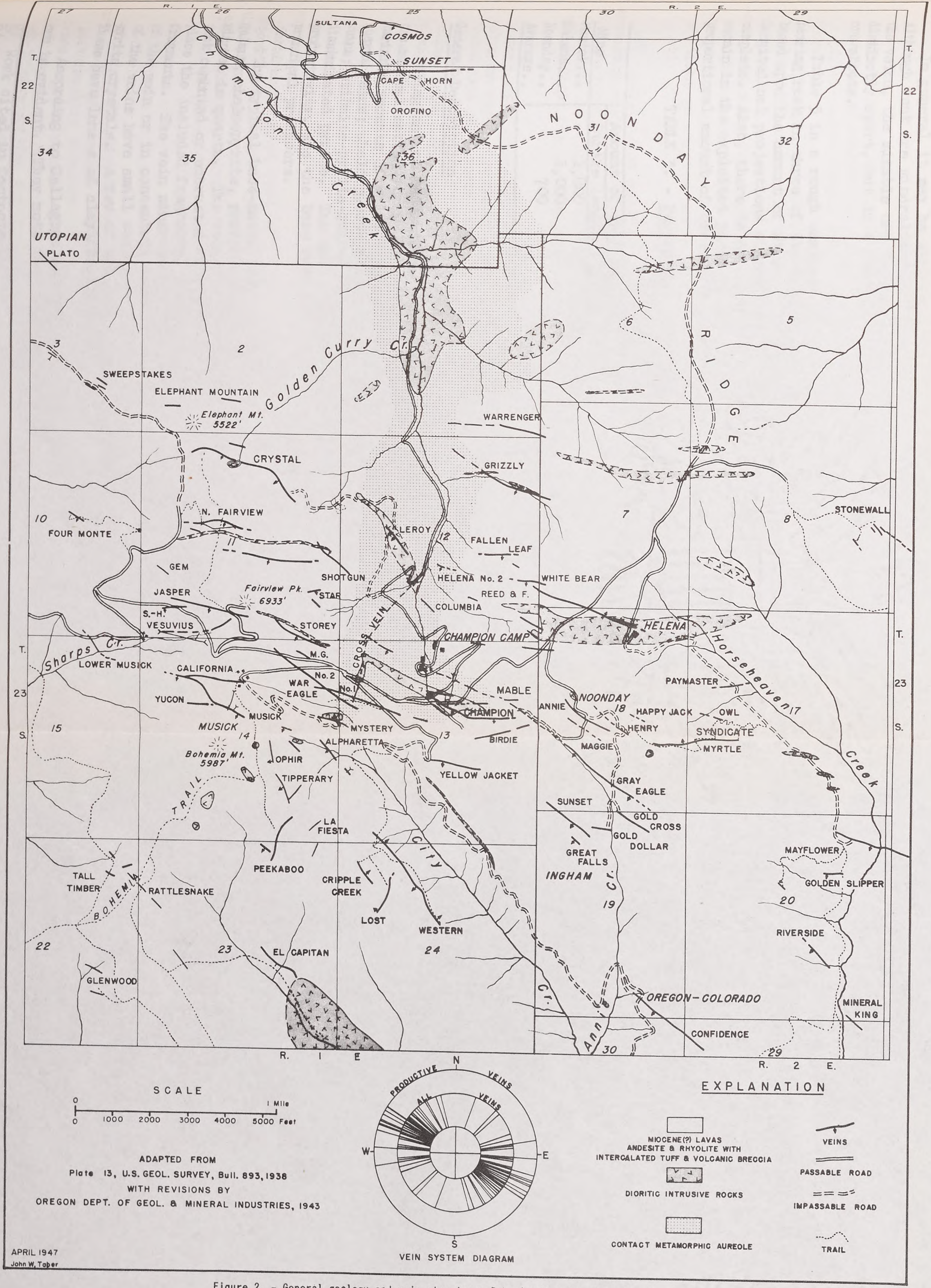

Figure 2. - General geology and vein structure, Bohemia district, Lane County, Oreg.

In general it may be said that the ore in the Bohemia veins is spotty. Although weak ore mineralization may often be traced continuously throughout the veins, the minable ore bodies are in definite shoots. These are usually distinctly apart, but in a few cases there is a suggestion of a train of linked ore shoots.

Table 3 is a rough analysis of the comparative amounts of barren and ore-bearing rock in three of the principal productive veins. The figures are based upon the amount of stoped area and the total explored area shown on the longitudinal projections of each mine. The stope data used are probably incomplete. Also, there is no allowance in the table for ore bodies that may remain in the exploited parts of the veins. Therefore, the figures for the proportional amount of ore-bearing rock are the minimum in each case.

TABLE 3. - Percentage of stoping in explored section of three of the principal mines

Mine	Amount of vein explored, feet		Percent waste	Percent ore
	Strike length	Maximum depth		
Musick...	1,800	325	68	32
Helena...	1,000	350	73	27
Noonday..	700	400	71	29
Average..			71	29

The Ore

General Description

Callaghan and Buddington[8] have recognized several classes of veins and ore mineralization in the district. These include base-metal veins with variable amounts of gold; veins of quartz and clay minerals; pyrite and cherty quartz veins; chalcopyrite-quartz veins; gold-quartz and gold-calcite-quartz veins; stibnite-pyrite-quartz veins; specularite and magnetite veinlets; and disseminated pyrite. The most significant of these, from the standpoint of productivity, are the base metal-gold veins. This group includes all of the principal producers.

The typical base-metal veins contain, in order of abundance, sphalerite, galena, chalcopyrite, pyrite, and specular hematite. The principal gangue mineral is quartz. The vein materials are commonly angular fragments of wall rock cemented or encrusted with comb quartz. The ore minerals sometimes replace the included fragments, but more often they fill the spaces between fragments. The vein minerals are often banded either parallel to the walls of the vein or in concentric bands around the included rock fragments. Most of the veins have small cavities, which are usually lined with quartz or pyrite crystals. A few of the veins show evidence of post-mineral movement. These have lenses of claylike gouge with included fragmentary vein minerals.

According to Callaghan and Buddington,[9] no vertical zoning of sulfide ore is evident. They note that no appreciable change in the mineralization takes place for depths up to 400 feet in the individual veins that have been explored. They also note that no appreciable change is evident through a vertical range of 2,800 feet between the highest and lowest vein.

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[8] Work cited in footnote 4.
[9] Work cited in footnote 4.

On the other hand, areal zoning has been definitely recognized by Callaghan and Buddington. They describe the central part of the district near the largest intrusive bodies as containing the largest and most persistent veins as well as the veins containing the most sulfides. This is well-supported by the centralized grouping of the most productive mines. The surrounding area, according to Callaghan and Buddington, is characterized by veins containing smaller amounts of sulfides and on the outer margins by veins containing stibnite and cherty quartz.

A small amount of gold is present in all of the base metal veins. The amount differs somewhat in the various veins but seems to accompany sphalerite-galena-pyrite ore wherever found. The gold is fine; it is rarely detected without magnification. Occasionally, small pockets of sulfide ore are found in which the gold content is high. These high-grade pockets are particularly characteristic of the Helena vein.

During the course of the field work, in 1946, a high-grade pocket was opened in the Helena vein. A specimen of the ore contained a large amount of fine gold easily detectable with the aid of a hand lense. The specimen consisted of a wavy band of cherty quartz separating serrated bands of galena and sphalerite. The quartz contained a fine sprinkling of gold particles. To the naked eye, the gold-impregnated quartz resembled chert stained a pale mustard-yellow color, such as might be imparted by limonite. Many of the particles of gold were large enough to be easily recognizalbe on polished surfaces without magnification. Under the microscope, many fine particles of gold were found intergrown with crystals of galena.

Weathering and Enrichment

Many of the veins are oxidized to as much as 100 feet below the surface. There is no evidence of appreciable sulfide enrichment. However, the leaching of sulfides is believed to have resulted in a residual concentration of gold in those veins in which the former sulfides contained appreciable amounts of gold. Some gold-enriched oxide ore has been mined in recent years, but most of the easily accessible bodies were removed prior to 1900.

Grade of the Ore

The metal content of the sulfide ores differs considerably from place to place. The gold content ranges from a trace to about 1 ounce. High-grade pockets have been found that contained as much as 10 ounces of gold per ton. The Helena mine has produced several such pockets. The silver averages about 2 ounces per ton, the lead 3 percent, the zinc 5 percent, and the copper about 1 percent. In many of the veins, zinc is the predominant sulfide metal. In a few, notably the Musick vein, lead is more abundant than zinc.

FACTORS AFFECTING MINING

Topography

Nearly all of the known veins in the district are situated near the crests of ridges or well up on the hillsides. Because the slopes are steep, (20° to 37°), most of the veins can be exploited through adit operations. Many of the veins can be explored from adits to depths of 500 to 1,000 feet without an excessive amount of dead work.

Underground Features

The ground stands up well in underground openings. Few timbers are needed, except near the portals or in brecciated sections of fissures that have had post mineral movement. It is true that much of the older workings are inaccessible, but this is mainly because a few sets of timber near the portals have rotted away and allowed the loose mantle rock to drop into the portals. Also, in some instances stopes have been worked to the surface, thus allowing eroded material to choke the upper levels.

Mining in the deeper workings has been mostly in open stopes with only minor support from occasional stulls or pillars. In some recent work in the Champion mine, a simple cut-and-fill stoping system was used.

Water Supply

A dependable supply of water for milling operations has always been a problem in the district. At the altitudes of the mines, most of the streams are small and intermittent. The supply from these sources usually must be supplemented by mine water or by accumulation from small springs. The shallow mine workings have very little water flowing from them. Those mines with more extensive workings, such as the Champion, Musick, and Noonday, have a moderate flow of water.

Timber Supply

Most of the mining claims are covered with a light to moderate stand of fir, cedar, and pine timber. Much of this could be sawed for mine timber. However, at Disston, about 15 miles from the district, there are several small operating saw mills. In the past such lumber and mine timbers as were required were obtained from these mills. Probably future operations likewise will depend on this source. Ore must be brought to Disston on trucks, hence lumber and other supplies can be hauled on the return trip from Disston at no appreciable additional cost.

As a result of the post-war building boom, prices of lumber and large-dimension timbers were at a high and unstable level. Under Office of Price Administration ceilings, lumber in sizes and grades suitable for mine timbers and lagging cost $20 to $30 per thousand board feet. During the first 6 months following abandonment of Federal price control, the price of these items nearly doubled.

Labor and Wages

Obtaining skilled mine workers has always been a problem to operators in the Bohemia district. It is far removed from centers of general mining activity. Occasionally miners are attracted to the district on the promise of being able to obtain a lease or part ownership in a mine. Otherwise, and for the most part, operators must depend on recruiting and training farmers, mill workers, and loggers from the surrounding area. At the outbreak of the war it became impossible to retain men in competition with West Coast war industries. Mainly on this account, activity in the district ceased for the duration of the war. During the year following the close of the war, work was resumed in a small way but the labor supply was greatly restricted by sharp competition from saw mills and logging operators in the surrounding area.

No regular scale of pay rates for mine workers has been established in this part of Oregon. Wages in the Bohemia district are almost entirely determined by logging-camp and saw-mill scales. During early 1947 the prevailing rate for unskilled saw-mill workers was $1.25 per hour. In the logging camps the unskilled-labor base rate was $1.275 per hour.

Power

Early operations in the district used steam power to drive the stamp mills. Later, in 1903, a hydroelectric plant was built on Frank Brice Creek for the consolidated operation of the Champion, Musick, and Helena mines. The generated power was transmitted by an 8-mile line up Champion Creek to the old Champion mill. The hydroelectric plant was used until the mill closed in 1907, after which the transmission line and plant were removed. All recent operations have used either gasoline-powered equipment or Diesel-electric plants. The mill built at the Champion mine in 1942-42 was powered by a Diesel-electric plant.

In 1946, the nearest electric power line was at Disston, 15 miles from the Bohemia district. This was a Rural Electrification Cooperative line supplied from Eugene, Oreg.

During 1946, Diesel fuel cost $0.075 per gallon delivered to mines in the Bohemia district.

Trucking and Railroads

All ores that have been produced recently from the district have been shipped without concentrating. Most of the ore was hauled in a truck owned by one of the operators. In 1946, a small lot of ore was hauled by contract in 12-ton trucks to the nearest main-line railroad at Cottage Grove, a distance of 34 miles. The rate for this haul was $5 per ton, including handling charges. A short-line railroad, the Oregon Pacific & Eastern, runs between Disston and Cottage Grove, where it connects with the Southern Pacific line. In recent years the railroad between Disston and Cottage Grove has not been used for ore shipments because a new spur and loading ramp are needed at

Disston. The following railroad freight rates were quoted in January 1947 for ore shipments to smelters that have received Bohemia ores in the past:

Through rate, Disston to Midvale, Utah, via Cottage Grove, Oreg. (minimum car, 100,000 pounds)

Value of ore	Cost per ton
$000 to $100	$ 12.77
100 to 200	14.09
200 to 300	15.42
300 to 400	16.73
400 to 500	18.05
500 to 600	19.37

Separate rate, Disston to Cottage Grove, Oreg.

Value of ore	Cost per ton
$000 to $100	$ 1.22
100 to 200	1.44
200 to 300	1.66
300 to 400	1.88
400 to 500	2.10
500 to 600	2.32

Cottage Grove, Oreg., to Midvale, Utah (minimum car, 80,000 pounds)

Value of ore	Cost per ton
$000 to $ 20	$ 7.82
20 to 30	8.37
30 to 40	8.92
40 to 50	9.47
50 to 60	10.02
60 to 70	10.85
70 to 80	11.67
80 to 90	12.50
90 to 100	13.32

Cottage Grove, Oreg., to Tacoma, Wash. (minimum car, 100,000 pounds)

Value of ore	Cost per ton
$000 to $ 20	$ 3.42
20 to 25	3.82
25 to 30	3.82
30 to 40	4.22
40 to 100	4.62
100 to 125	5.62
125 to 200	7.49
200 to 300	8.81

Smelters and Smelter Schedules

Most of the ore from the Bohemia district has been shipped to a copper smelter at Tacoma, Wash. With the increase of sulfide-ore production in recent years, it has been the practice to ship the better-grade lead-zinc ores and concentrates to Utah custom mills and smelters, where payment is made for the recoverable lead and zinc. As a general rule, the choice between shipping Bohemia crude ores to a copper smelter or to a lead-zinc custom mill and smelter depends on whether the value of the recoverable lead and zinc is greater than the custom-milling charge plus the extra freight charge to the more distant lead-zinc plant. If the ores are concentrated by selective flotation at the mine, several products can be made, each of which may then be shipped to the appropriate smelter, where the maximum amount of metal is recovered. Freight differences are thus minimized by the higher value of the product and compensated by the extra money received for metals not otherwise recoverable. Examples of typical ore-purchasing schedules for copper smelters, lead-zinc smelters, and lead-zinc custom mills are shown in table 4.

TABLE 4. - Smelter - open schedules

Gold-silver-copper smelter

Payments: (Prices in effect January 1947).

GOLD - All gold if 0.03 ounce or over per net dry ton at $19 per ounce plus 90 percent of the premium in excess of $20.67 per ounce realized for domestic mined gold from the U. S. Mint (that is, $34.9125 less $20.67, as in effect January 1947).

SILVER-Pay for 95 percent with minimum deduction of 1/2 ounce per net dry ton at U. S. Treasury price for newly mined silver ($0.905 per ounce, January 1947). Payment pending delivery of affidavit to U. S. Treasury attesting that silver is newly mined.

COPPER-Pay 100 percent of copper on wet assay, less 20 pounds of copper per dry ton of ore, at net refinery quotation of electrolytic wire bars, as published in the Engineering and Mining Journal for the date of arrival of the ore at the smelter, less a deduction of $0.025 per pound of copper accounted for.

No payment will be made for any metal or content except as specified above.

Base charge:

Maximum of $6 per dry ton, f.o.b. cars at smelter. This charge may be quoted substantially lower to individual shippers in consideration of such factors as available silica (high silica content desirable) and value of the ore.

TABLE 4. - Smelter - open schedules (Cont'd.)

Settlement:

Immediately upon receipt of all necessary information.

Penalties:

ZINC - 5 percent free; $0.30 a unit will be charged for any excess; fractions in proportion.

ARSENIC - 1 percent free; $0.25 a unit will be charged for any excess; fractions in proportion.

ANTIMONY - 1 percent free; $0.50 a unit will be charged for any excess; fractions in proportion.

NICKEL - One-half percent free; $3. a unit will be charged for any excess; fractions in proportion.

Lead smelter

Payments: (Prices shown are those in effect January 1947).

GOLD - If 0.02 ounce per ton or over, pay for 91 percent of the gold content at the current government price.

SILVER - Pay for 95 percent of the mint price ($0.905 per ounce). Minimum deduction 1/2 ounce per dry ton.

COPPER - Deduct 15 pounds per ton and pay for the balance at the average of the quotations for electrolytic copper in New York, as published in the Engineering and Mining Journal for the week ending Wednesday next preceding date of sampling, less $0.060625 per pound.

LEAD - Deduct 1-1/2 units from the wet assay and pay for 90 percent of the balance at the average of the quotations for lead in New York for the week ending Wednesday next preceding date of sampling, as published in the Engineering and Mining Journal, less $0.015625 per pound.

ZINC - If 10 percent or over, pay for 75 percent at 22 percent of the East St. Louis price for prime western zinc. (Nothing paid for zinc if less than 10 percent).

Credits and charges:

INSOLUABLE - Charge at the rate of $0.10 per unit.

LIME - If 5 percent per ton or over, credit at the rate of $0.05 per unit.

TABLE 4. - Smelter- open schedules (Cont'd.)

IRON - Credit at the rate of $0.06 per unit.

SULFUR - 2 percent free, charge sulfur over 2 percent at the rate of $0.25 per unit. Maximum sulfur charge $2.50 per ton.

ARSENIC and ANTIMONY combined - 1 percent free, charge for the excess over 1 percent at the rate of $0.50 per unit.

ZINC - Charge all at $0.15 per unit. (If zinc is not paid under provisions of this schedule, then the penalty will be 6 percent free, excess charged at $0.30 per unit.)

Treatment charges:

$3 per ton when the settlement lead content, which is the wet assay, less 1-1/2 units, is 30 percent. Credit the treatment charge at the rate of $0.10 per unit for deficiency of settlement lead content under 30 percent.

Deduction from the price of copper and lead is based upon the present all-rail bullion freight rate to eastern refineries at $13.75 per ton. Any variation in this bullion freight rate to be for the account of the shipper. The paid-for metals under this schedule are subject also to a charge that reflects the 3 percent tax on lead, copper, and zinc all-rail bullion freights.

Lead-Zinc Custom Mill (Utah)

The following is a typical sulfide lead-zinc mill schedule for ores amenable to selective flotation. This is not used as a definite quotation for all mill ores, as lead-zinc schedules are formulated for each particular ore after testing samples that are representative as to grade and character of material.

Payments: (Prices shown are those in effect February 1947).

GOLD - Pay for 70 percent of the gold content at the government price, which is now $35 per ounce. Minimum deduction 0.01 ounce per ton.

SILVER - Pay for 80 percent of the silver content on the basis of the "Mint Price" as defined in the Silver Schedule that follows, except as therein otherwise provided. Maximum deduction, 1/2 ounce per dry ton.

If, however, the Seller shall so elect, the price payable for the silver content of the Seller's product shall be based upon the average of the Handy & Harman New York quotations for foreign silver for the calendar week following date of arrival of last car of each lot at the plant of the buyer, provided notice of such election shall be given to the buyer in advance of said quotational period.

TABLE 4. - Smelter - open schedules (Cont'd.)

LEAD - Pay for 80 percent of the lead content at the average of the quotations for lead in New York, as published in the Engineering and Mining Journal for the week ending Wednesday, next preceding date of sampling, less $0.023425. Minimum deduction, 20 pounds per dry ton.

ZINC - Pay for 65 percent of the zinc content at the average East St. Louis price for Prime Western Zinc, as published in the Engineering and Mining Journal for the week ending Wednesday, next preceding date of sampling, less $0.027425 per pound when such price for zinc is $0.05 or less. To this deduction of $0.027425 add $0.04 for each 1 cent increase in the price of zinc over $0.05. Minimum deduction, 60 pounds per dry ton.

Treatment charge:

$2.75 per ton, f.o.b. buyers plant, in not less than carload lots.

Deduction from the price of lead paid for is based upon the present all-rail bullion freight rate to eastern refineries of $16.84 per ton, plus the 3 percent federal transportation tax, or a total all-rail bullion freight rate of $17.35 per ton. Any variation in this bullion freight rate and/or federal transportation tax to be for the account of the shipper.

Treatment charge is based on buyer's present cost of $7.93 for common labor per shift of 8 hours. The treatment charge will be increased or decreased at the rate of $0.06 per ton for each $0.25 increase or decrease in the cost of common labor.

Silver Schedule[10]

1. This schedule shall be applicable to the silver content of the Seller's product qualified for delivery to coinage mints of the United States under Act of Congress approved July 31, 1946, and applicable Regulations whereby silver mined subsequently to July 1, 1946, from natural deposits in the United States or any place subject to the jurisdiction thereof may be tendered to a Mint, within 1 year after the month in which the ore from which it is derived was mined, in exchange for standard silver dollars coined from 70 percentum thereof (or silver certificates or any other coin or currency of the United States in an amount in dollars equal to such standard silver dollars), the remaining 30 percentum, with the consent of the owner, to be deducted and retained by the Mint as seigniorage for services performed by the Government relative to the coinage and delivery of standard silver dollars.

2. Accordingly, for the period of the principal agreement (to which this schedule is attached) during which the Smelting Company

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[10] From schedule provided by International Smelting & Refining Co.

TABLE 4. - Smelter - open schedules (Cont'd.)

shall have the right under said Act of Congress and applicable Regulations to exchange the silver contents of the Seller's product for standard silver dollars representing 70 percentum thereof (or an equal amount in other coin or currency of the United States), the payment for silver to be made to the Seller shall be 90 cents per ounce, being the approximate value per ounce of the standard silver dollars or fractions thereof receivable by the Smelting Company upon such exchange, adjusted to the equivalent value of silver 0.999 fine and to cover cost of delivery and expense of meeting requirements and conditions prescribed for acceptance at the Mint.

3. Settlement for silver on the basis of 90 cents per ounce, which is the Mint price referred to in the principal agreement, shall be subject, nevertheless, to the deductions specified in said principal agreement and to the condition that the Seller shall furnish the Smelting Company all such certificates, affidavits, or other proofs and reports as may be required from time to time to qualify the entire silver content of the Seller's product for delivery to the Mint under said Act of Congress and all applicable Regulations; payment by the Smelting Company on the basis of the Mint price to be subject, also, to final acceptance by the Government of the silver covered by the Seller's affidavits.

4. The silver content of the Seller's product shall be tendered to the United States Mints by the Smelting Company as promptly as practicable, that is to say, as soon as may be consistent with operating conditions and Governmental requirements, unless the Seller shall elect to receive payment for said silver on the basis of the Handy & Harmon New York quotations for foreign silver specified in the principal agreement, in which event this schedule shall not become applicable thereto, and payment on said basis shall be final.

5. In the event that, for any reason whatsoever, the Government shall refuse to accept the silver covered by the Seller's affidavit, or the entire silver content of the Seller's product shall not be qualified for delivery to the United States Mints, the price payable for the silver content of the Seller's product shall be based upon the average of the Handy & Harman New York quotations for foreign silver for the thirty (30) quotational days following the date of such refusal, or following the date when the Smelting Company shall finally notify the Seller that said silver content is not qualified for delivery to the United States Mints under said Act of Congress and applicable Regulations, whichever date shall sooner occur; and the Seller shall refund to the Smelting Company the amount by which the price paid to the Seller for silver under this schedule shall be in excess of the amount payable on the basis of said quotations; and furthermore,

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TABLE 4. - Smelter - open schedules (Cont'd.)

if the Mint price per ounce payable in respect to silver covered by the Seller's affidavit, at the time of tendering the same to the Mint, shall be less than the Mint price per ounce on the basis of which payment shall have been made to the Seller, the Seller shall reimburse the Smelting Company for the difference applicable to the payable silver content of the Seller's product.

MINES AND MILLS

Resume of Operations

Exploitation in the district may be divided roughly into three phases. First came the boom period, when most of the discoveries were made. During this period gold and silver were the metals sought. Enriched oxidized ore shoots were prospected at the surface and followed downward to shallow depths. Small stamp-amalgamation mills were set up at nearly every promising deposit. Later, as the more productive veins were singled out, venture capital was attracted to the district and several of the properties were consolidated to supply ore to a large centrally located stamp mill. At about this period the workings began to encounter increasing amounts of sulfide-ore minerals. As the sulfide ores were reached in the veins, recoverable gold content fell off sharply. Fine gold in the unleached ores was difficult to recover by amalgamation; consequently, stamp milling soon became unprofitable. Some attempts were made to introduce jigs and other early gravity-separation devices to produce a bulk sulfide concentrate. For various nontechnical reasons this was not a successful conversion. As the leached free-gold ore bodies gave out, the stamp mills were abandoned one by one.

During the last phase of operations in the district, several small flotation mills were introduced. These operated successfully on ore bodies that had been explored but abandoned during the stamp-amalgamation period. Little effort was made to carry on new exploration and development programs while the sulfide concentrators were in operation. Ultimately, the developed ore was mined out, and the mills were forced to shut down. Just prior to the outbreak of the war, a plan to build a 100-ton selective flotation mill at the Champion mine was formulated. This mill was designed to treat ores from several of the principal mines in the district. Through this plan of operation it was believed that exploration and development could be carried on simultaneously in enough different places to assure a steady supply of ore. The necessary initial development was well-started, and the mill was operating when the full impact of war-created labor competition struck the camp. Wartime restrictions prevented the operation from treating the more profitable high-gold ores; this, in turn, forced the camp to shut down because of inability to pay the wages required to compete for labor against West Cost war industries. Operating mining leases on the group of properties were terminated as a result of the shutdown. In 1947 a new group planned to purchase the mill and to obtain new leases on the several mines preliminary to resuming the original plan of operation. The mill had not been dismantled.

Principal Mines

In this group are included mines known to have been productive. The properties are reviewed in approximately chronological order, beginning with the most recent operation. In each case an attempt has been made to present all of the important factual data available. It is acknowledged that in many cases this may be incomplete. Nearly all of the properties have had several owners and numerous operators. Comparatively few engineering records of any of the operations were kept.

Champion Mine

The main road into the district crosses the Champion claims. Most of the portals are within a few hundred feet of this road. The road is a graveled single-track route that follows Champion Creek gulch for about 15 miles from Disston to the mine. All but about 1 mile is an easy grade at near creek level. The last mile of the road is a switchback grade up to 15 percent.

The property consists of 22 unpatented claims and 1 patented claim situated in sec. 13, T. 23 S., R. 1 E., W.M. These are owned by Fred J. Bartels of Disston, Oreg. Bartels has had control of the property, formerly through corporate holdings and later outright ownership, over a period of 25 years.

The workings, now generally referred to as the Champion mine, include two connected workings that were originally developed as independent mines. The Champion vein, one of the longest in the district, begins well down on the north side of the main ridge near the head of Champion Creek (fig. 2). It extends through the ridge to the City Creek side. The principal workings (the original Champion mine) exploited the vein from the Champion Creek side. On the City Creek side the vein was worked through the Evening Star mine. The Evening Star drift was eventually connected to the 600-level drift of the Champion mine (fig. 3).

Since its discovery in 1892, exploitation of the Champion mine has been a series of small, profitable operations and larger expensive failures. Until about 1903, mining was almost entirely on oxidized ore. The ore was treated in a 10-stamp mill during this period. No attempt was made to recover base metals. In 1903 the Oregon Securities Corp. acquired the property along with the Musick and Helena mines. The mill on the Champion property was enlarged to 30 stamps. The operation produced a substantial amount of gold during the next 3 years but failed to pay back the original investment, and the company was forced into receivership in 1907. In the ensuing years to 1922, the Champion mine was operated by several successive companies. Much of the production during this time was from sulfide ore. Gravity separation of sulfides was introduced during this period, and the first production of copper and lead was made. After 1922, most of the ore was shipped to the smelter without concentration.

Bartels operated a small cyanide mill on the Evening Star mine in 1926. In 1935 the Evening Star Mines Co. leased the Champion and Evening Star properties and built a 50-ton flotation mill. This mill was operated for only a few

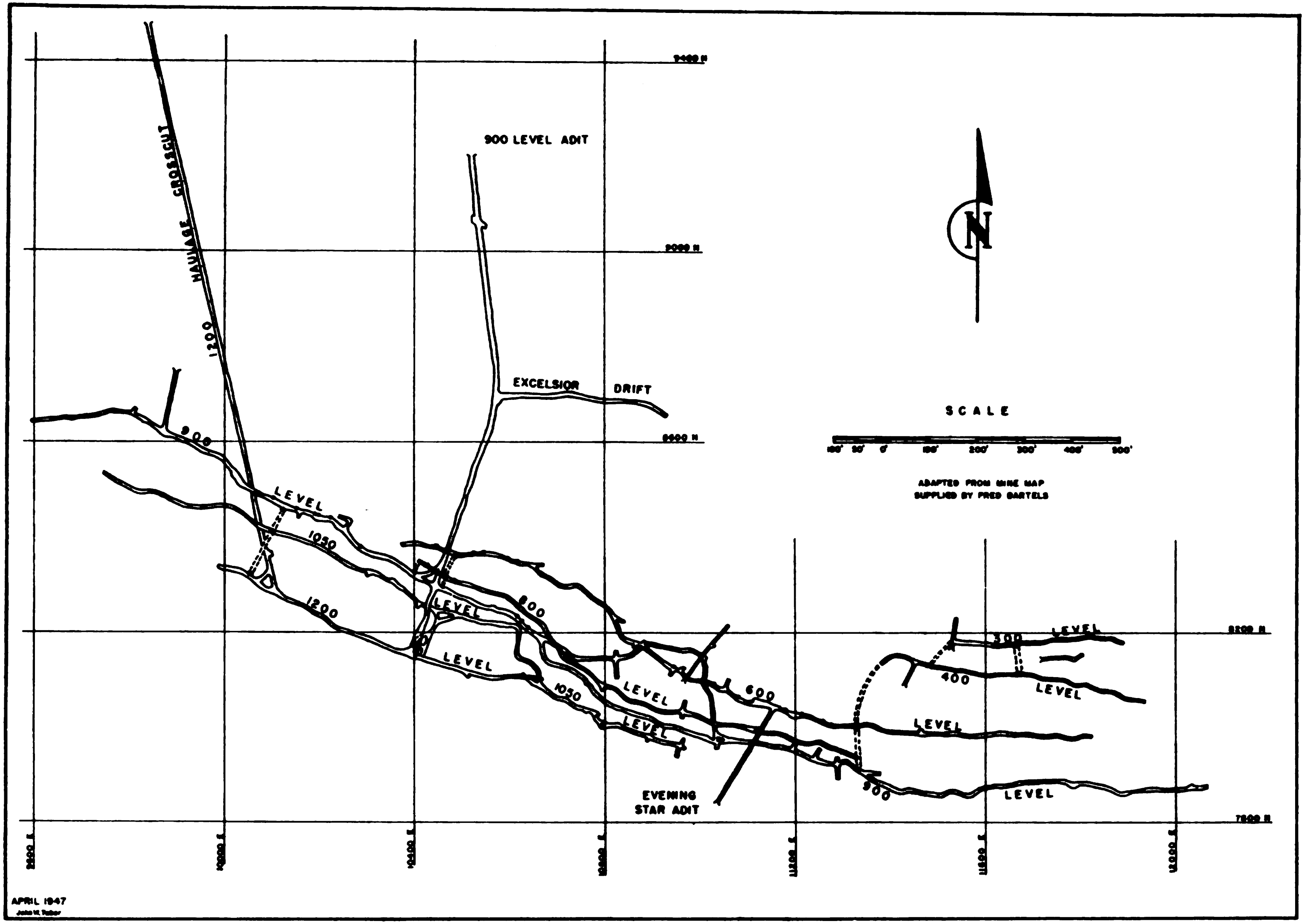

Figure 3. - Composite plan of Champion mine, Lane County, Oreg.

months before it was shut down. In 1939 the H & H Mines Co. leased the Champion, Musick, and Noonday mines. The H & H Mines Co. did considerable developing in the mines, erected a modern, 100-ton selective-flotation mill, and treated 12,416 tons of ore before closing down in 1942. Since then the property has been idle except for a small amount of mining done by Bartels during 1945 and 1946. The mining by Bartels was on oxidized ore from the Evening Star workings. The ore was selected to maintain an average of 2 ounces of gold or better per ton. It was shipped directly to the smelter. Recorded metal production for the Champion and Evening Star mines is shown in table 5.

TABLE 5. - Metal production, Champion and Evening Star mines, Lane County, Oreg. (From data supplied by Alfred L. Ransome.)[11]

Year	Crude ore, tons	Gold, ounces	Silver, ounces	Copper, pounds	Lead, pounds	Zinc, pounds
1895.......		90				
1896.......		484				
1897-1902..	No record					
1903.......	1,000	290				
1904.......	No record					
1905.......	6,000	2,184	1,007			
1906-1920..	No record					
1921-1922..	No record					
1923.......	200	95	43			
1924.......	100	97	46			
1925.......	78	63	30			
1926.......		2	1			
1927.......	No record					
1928.......	50	46	20			
1929-1930..	No record					
1931.......	300	243	118			
1932.......	No record					
1933.......	120	87	150		401	
1934.......	225	66	28			
1935.......	3,000	268	807	5,399	7,447	
1936.......	350	148	823	7,629	9,340	
1937.......	400	122	465	3,940	4,820	5,550
1938.......	5	7	6	29	90	
1939-1941..	No record					
1942.......	12,416	1,085	12,673	171,086	40,498	
1943-1944..	No record					
1945.......	53	94	217	1,500	600	
Total.....	24,297	5,471	16,434	189,583	63,196	5,550

The Champion vein is in a sinuous fissure trending about N. 65° W. in the northern part of the mine and nearly due west in the southern part. The mean dip of the productive part of the vein is about 70° southwest. Local variations in both strike and dip are common, but the over-all trends are persistent.

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[11] Supervising engineer, Western Region, Metal Economics Division, Bureau of Mines.

The wall rocks along the vein are andesite, rhyolite, tuff, and granodiorite porphyry. The vein minerals are sphalerite, pyrite, chalcopyrite, galena, hematite, and cherty to coarse crystalline quartz. Silicification and sericitization of the wall rocks are common.

Ore now remaining in the mine is mainly sulfide. The sulfide ore is similar to that of other mines in the district. Base-metal content is uniformly low. Zinc predominates slightly over copper and lead. The gold is variable but generally just under 0.5 ounce per ton. A few small, partly oxidized, sulfide shoots remain; these shoots contain up to 2 ounces of gold per ton. A number of high-grade shoots, which contained pockets of much higher-grade gold ore, have been mined. Watkins[12] states that an average analysis of 1,548 samples (assay weighted against width of sample) taken by the H & H Mines Co. from all parts of the mine was as follows:

Ounces gold	Ounces silver	Percent lead	Percent zinc	Percent copper
0.555	4.21	1.72	2.15	1.71

The Champion mine is developed through a vertical range of 1,000 feet to an average depth of 600 feet below the surface (fig. 4). It has been explored for 2,700 feet along the strike of the vein. There are over 15,000 feet of drifts and crosscuts and about 3,000 feet of raises. The mine has nine levels. Three of the principal levels have portals. The lowest, or 1,200-foot level, serves as the main haulage tunnel. The portal of the 1,200-foot level connects with the mill and is in the center of the camp area. All of the workings, including the Evening Star, may be reached through raises from the 1,200-foot level. Except for a small part of the oldest levels that has caved through to the surface, the workings are open and in good condition. Though soft, the ground stands well; few timbers are needed in the drifts. The stopes require only occasional stulls for support. The timber is used chiefly for raise linings and to support stope fills.

Early mining was done entirely with open stopes. More recent work has been with shrinkage and cut-and-fill stopes. Cut-and-fill stoping was first introduced during the last regular operation of the mine in 1942. This method did not prove entirely satisfactory because of failure to obtain a clean separation between ore and fill rock. However, the period during which the method was tried was too short for an adequate test.

In 1942 the property was fully equipped for a small modern operation. This included track and air line throughout most of the mine, all necessary mining equipment, and an outside plant with a Diesel-electric power, mine compressor, machine shop, blacksmith shop, assay office, and a 100-ton selective-flotation mill. Plant buildings are wood-frame steel construction. Other outside improvements include a haulage track shed, a tunnel house, a mine office, a change house, a cook house, a bunkhouse adequate for 75 men, a four-unit apartment house, and seven small dwelling houses.

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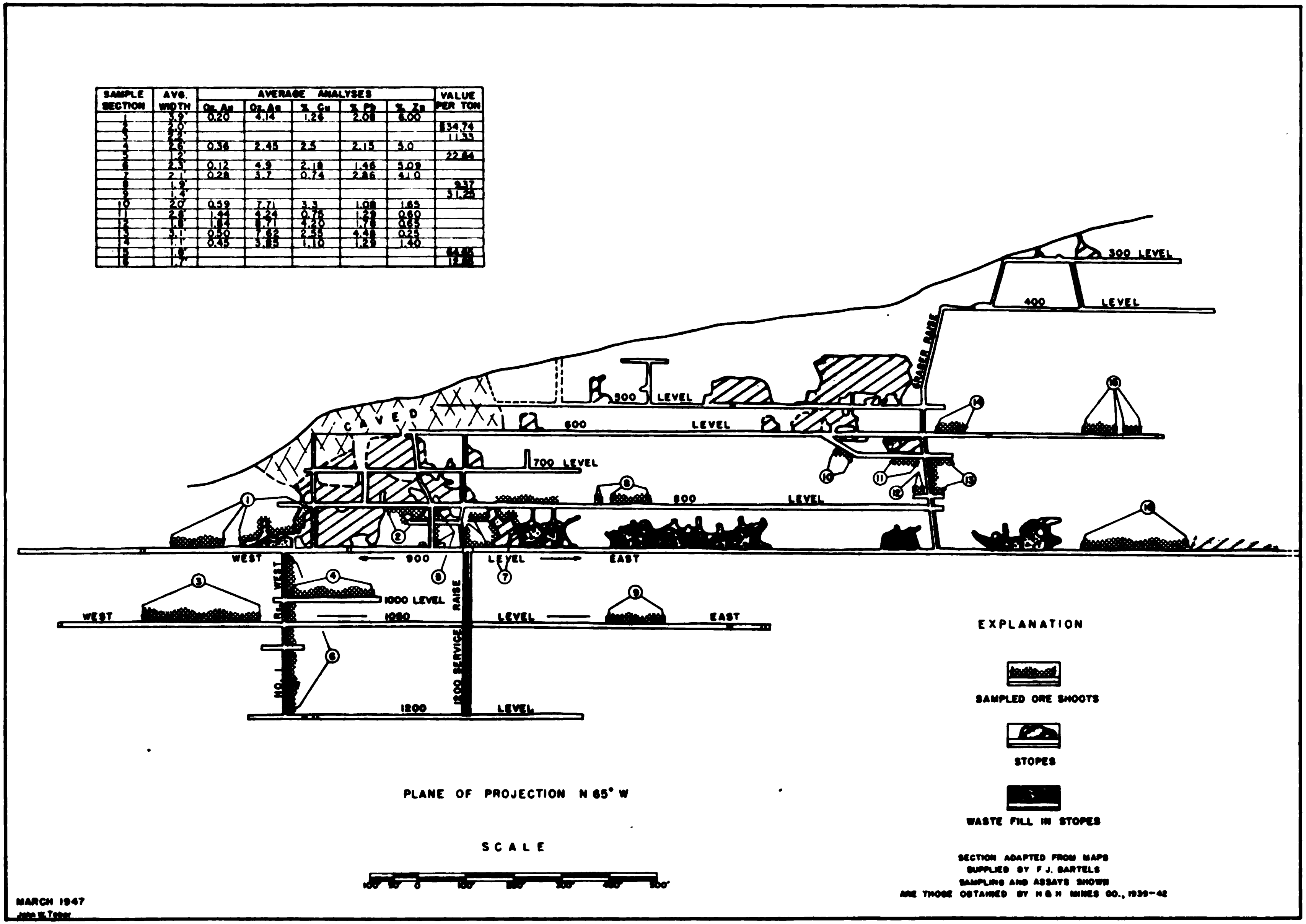
[12] Watkins, Kenneth, Unpublished report on several properties in the Bohemia district, 1946.



SECTION ADAPTED FROM MAPS SUPPLIED BY F. J. BARTELS

SAMPLING AND ASSAYS SHOWN ARE THOSE OBTAINED BY H & H MINES CO., 1939-42

SAMPLE SECTION	AVG. WIDTH	AVERAGE ANALYSES					VALUE PER TON
		Oz. Au	Oz. Ag	% Cu	% Pb	% Zn	
1	3.9'	0.20	4.14	1.26	2.08	6.00	
2	2.0'						$34.74
3	2.2'						11.33
4	2.6'	0.36	2.45	2.5	2.15	5.0	
5	1.2'						22.64
6	2.3'	0.12	4.9	2.18	1.46	5.09	
7	2.1'	0.28	3.7	0.74	2.86	4.10	
8	1.9'						9.37
9	1.4'						31.25
10	2.0'	0.59	7.71	3.3	1.08	1.65	
11	2.8'	1.44	4.24	0.75	1.29	0.60	
12	1.8'	1.84	8.71	4.20	1.78	0.65	
13	3.1'	0.50	7.62	2.55	4.48	0.25	
14	1.1'	0.45	3.85	1.10	1.29	1.40	
15	1.8'						[illegible]
16	1.7'						[illegible]

Figure 4. - Longitudinal section, Champion mine, Lane County, Oreg.

The mill is a compact well-built unit in a steel building connected with the portal of the 1,200-foot level by a steel tunnel house. Thirty cubic-foot, V-body ore cars were used to deliver ore to the mill. A switch house is built over the 100-ton coarse-ore bin. The track is arranged for hand dumping of the cars to a horizontal rail grizzly. The coarse ore was moved by a pan-feeder over a vibrating grizzly and through two-stage jaw crushing, after which it was raised by a 100-foot belt conveyor to a 200-ton fine-ore bin. Fine ore was delivered by a belt feeder to a ball mill and classifier in closed circuit. The fine product from the classifier then flowed through a conditioner tank to the selective-flotation circuit. Flotation concentrate from the rougher cells was sent directly to a Wilfley table, where the free gold was removed in a high-grade gold concentrate, and the remainder of the rougher concentrate was added to the final lead-copper concentrate. The remainder of the pulp from the rougher cells was fed to scavenger and cleaner cells to produce a lead-copper concentrate and a zinc concentrate. Separate thickener-filter circuits were employed to dehydrate the two final base-metal concentrates.

Since the last lessee discontinued operations in 1942 the equipment and facilities have not been in use. When the property was visited in 1946, all of the heavy equipment was intact and in good shape except the Diesel-electric plant, the mine compressor, and a primary jaw crusher that had been removed from the property.

During 1946 Bartels had a small portable compressor at the Evening Star portal, which he used to mine small pockets of oxidized ore on the east end of the 600-foot level.

Helena Mine

The Helena mine is one of the oldest in the district. Although it has never been a large producer, it is outstanding because of the unusually high gold content of the ore. In view of the exceptional quality of the ore, it is surprising to note the comparatively small amount of exploring that has been done on the property. Despite the fact that ore shoots have been as frequent as in any of the other exploited veins in the district, the total amount of development is less than the amount of exploration drifting done on many of the prospects that have never produced. This paradoxical situation may be because of the unusually shallow depth of oxidation in the Helena ore shoots. It is probable that the small amount of leached easy-milling ore discouraged extensive development during the early boom period, when most of the work in the district was done.

The mine is situated on the southeast slope of Grizzly Mountain, in secs. 7 and 18, T. 23 S., R. 2 E., W.M. (fig. 2). It is 3.3 miles via a single-track switchback road from the Champion mine camp. The road ascends the main ridge on a 12-percent grade to the Champion saddle, from whence it follows northeasterly along the ridge, skirting around the southeast side of Grizzly Mountain. The lower tunnels and the Helena camp are about 500 feet below the level of the main road. The mine is reached from the main road by a half-mile side road, which cuts steeply (14-percent grade) down the mountainside.

The property consists of three patented and seven unpatented lode claims. These are owned by Henry D. Moyle of Salt Lake City, Utah, and Kenneth O. Watkins of Disston, Oreg. Watkins, who is in charge of the mine, has done a small amount of development work and has mined a few cars of ore incidental to the development during 1945 and 1946.

Following the discovery of the Helena vein in 1896 by C. P. Bruneau, its history is mainly the mining of two ore shoots during the boom days of the camp and thereafter a succession of changes in ownership, with scattered small-scale lessee operations. In 1899 the Jennings brothers purchased the property from Bruneau and installed a 5-stamp mill. A large ore shoot and another smaller shoot were developed on two levels during the ensuing year; they were mined out by 1902. According to the dimensions of the stopes, about 10,000 tons of vein matter was removed during this period. Old newspaper accounts state that most of the ore was sulfides. The small amount of oxidized ore was reported by these accounts to contain much free gold; one account listed assays of $30,000 per ton. Watkins[13] estimates the production from these stopes at $1,500,000. His estimate is based largely upon the assumption that old reports, claiming the ore assayed $100 to $300 per ton, are substantially correct. His assumption is substantiated by his observation that samples of ore left on the margins of the old stopes assayed around $50 per ton. The value of the metal actually recovered from these stopes was probably far below that given by Watkins. The ore, largely sulfide, was treated by stamp amalgamation to save only the gold and silver. Doubtless recovery was low; probably it was less than half the gold and silver content of the ore.

After 1902 the Jennings brothers bought the Champion and Musick mines. Shortly thereafter the three properties were purchased by the Oregon Securities Corp., which was later succeeded by the West Coast Mines Co. No work was done on the Helena property by either of these companies. In the early 1930's, L. M. Capps purchased the mine from the West Coast Mines Co. In 1935, F. Dale Wyatt of Eugene, Oreg., leased the mine from Capps. According to Watkins,[14] Capps produced direct shipping ore from the bottom of the smallest Jennings stope that netted $51,000. Wyatt organized the Helena Mining Co. in 1935 and built a 35-ton flotation mill. This operated only a few months and shut down. In 1937, William Reaves leased the mine and mill. Reaves opened a new stope on the No. 4 level. Watkins[15] states that in 100 days' operation Reaves netted $47,000. Reaves mined the ore shoot, which averaged about 50 feet long, through to the surface, a distance of 200 feet. He then bought the mill from the owner and removed it from the property. The lease and subleases were terminated shortly thereafter, and control of the property reverted to Capps. The Mines Service Company leased the mine from Capps in 1938. Watkins[16] states that this company mined $7,700 worth of direct-shipping ore from an underhand stope in the floor of the drift under the Reaves stope. The property again reverted to Capps. It remained idle until 1945, when Wyatt purchased it. Wyatt did a small amount of development work and sold to Kenneth Watkins, who in turn sold

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13/ Work cited in footnote 12.
14/ Work cited in footnote 12.
15/ Work cited in footnote 12.
16/ Work cited in footnote 12.

a three-fourths interest to Henry D. Moyle of Salt Lake City, Utah. At the time of the authors visit in 1946, Watkins was in charge of the mine. He was advancing the No. 7 level drift and had just encountered a new ore body. It was from this ore body that the author obtained the high-grade gold specimen described earlier in the report.

The Helena vein is in a strong fissure, which has been traced from well down on the east slope of Grizzly Mountain through to the summit and a short distance down the west slope. The horizontal distance explored by drifts and trenches is 3,000 feet. The vein strikes about N. 57° W. and dips 65° to 70° NE. It is the only strong vein belonging to the northwest-striking system that has a northeasterly dip. All of the workings on the vein are on the southeastern end. The vein has been explored and partly mined throughout a horizontal distance of 1,000 feet and to an average depth of 200 feet.

All of the ore shoots that have been mined were discovered at the surface and subsequently mined downward to their apparent termination. These shoots have been 50 to 200 feet long; each has extended approximately 200 feet below the outcrop (fig. 5). The ore shoots have been 3 to 8 feet wide, averaging 4 feet.

Although all of the ore shoots were exposed at the surface, oxidation was apparently exceptionally shallow, compared to the other veins in the district. Diller[17] found fine specimens of free gold in the oxidized ore.

The sulfide ore is a comparatively hard vein filling between softer altered granodiorite and andesite. Callaghan and Buddington[18] describe the ore as consisting chiefly of sphalerite with some pyrite, chalcopyrite, galena, and a little tetrahedrite along with quartz, included rock fragments, kaolin, and barite. They recognized several stages of vein filling; the first consisted of greenish quartz, some fine-grained with microcencretionary structure, and sulfides. Brecciation of the first vein matter followed. The broken fragments were then encrusted with comb quartz. Following the second stage of quartz mineralization was a succession of alternating crusted deposits of sphalerite, comb quartz, and cherty quartz, followed finally by pyrite and barite.

Samples of the ore taken by the author from the new ore shoot, which was being opened at the face of the No. 7 level (fig. 5), assayed as follows:

Sample	Kind	Au, oz.	Ag, oz.	Pb, percent	Zn, percent	Cu, percent
112.....	Grab[1]	3.90	3.0	4.5	5.5	1.05
113.....	do.	3.58	2.6	3.7	5.1	0.95
114.....	do.	2.19	3.1	6.4	5.9	1.60
115.....	do.	2.93	2.5	4.5	6.9	1.20

[1] Grab samples taken from finely broken ore newly blasted down in stope. Stope averaged 4 feet in width, was 20 feet long, and back was about 15 feet from floor of drift.

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[17] Work cited in footnote 3.

[18] Work cited in footnote 4.

The mine has been developed by three principal levels and three short adit drifts. Altogether, there are about 2,000 feet of drifts and crosscuts and about 500 feet of raises. All of the principal levels are connected by raises, so that the lowest (No. 7 level) may be used as a general haulage level for the mine. Except for about 100 feet of the No. 6 level, which has been stoped out, all of the drifts are open and in good condition.

All of the early mining was done in overhead and underhand open stopes with a few stulls and headboards to support weak sections of the hanging wall. The ground is not heavy but has a tendency to slough gouge and soft material from the hanging wall. Watkins believes that shrinkage stoping is the most suitable system for the Helena as well as other veins in the district. In some instances where the veins are narrow and the limits of the ore are sharp, a system of resuing or stripping in filled stopes might be equally as good and would permit mining much narrower ore shoots with minimum dilution of the ore.

The mine is equipped with track and air line throughout most of the principal drifts. A portable one-machine compressor and a minimum of small mine tools are at the mine. The outside improvements consist of a small tunnel house, a small metal-covered mill building, an ore bin of about 100 tons capacity, and a combination bunkhouse and cookhouse suitable for accomodating 20 men. The camp is supplied with running water from a spring cistern. Water from the spring plus mine water probably would be enough to operate a 50-ton flotation mill.

Musick Mine (Bohemia Mine)

The Musick mine is about a mile west of the Champion mine and on the opposite side of the main ridge that separates the City Creek and Champion Creek drainages. The main portal, at an altitude of 5,000 feet, is on the City Creek side near the base of Bohemia Mountain. The course of the vein is across a 5,400-foot spur ridge between the headwaters of Sharps Creek and City Creek. Timber is spotty and scrubby; the cover is chiefly low brush, particularly on the east slope, where the camp and mill were situated.

The Musick group consists of 14 unpatented claims situated in sec. 14, T. 23 S., R. 1 E., W.M. (fig. 2). The claims are owned by L. M. Capps, of Blackfoot, Idaho. In 1946 the property was under lease and option to purchase by the Tar Baby Mining Co. of Salt Lake City, Utah.

The mine is easily accessible by a good truck trail. It is 36 miles from Cottage Grove, Oreg., via the Champion mine. It is 1.8 miles beyond the Champion camp. The road is steep for about three-fourths of a mile from the Champion mine to the Champion saddle, from whence it is level along the ridge west to the mine.

James C. Musick is credited with the discovery of the Musick vein in 1891. The following year Musick is said to have erected a 5-stamp mill on the property. This was the second mill built in the district. Musick organized the Bohemia Gold Mining & Milling Co., which operated the mine and mill continuously until 1901. This was apparently the most sustained productive period of the

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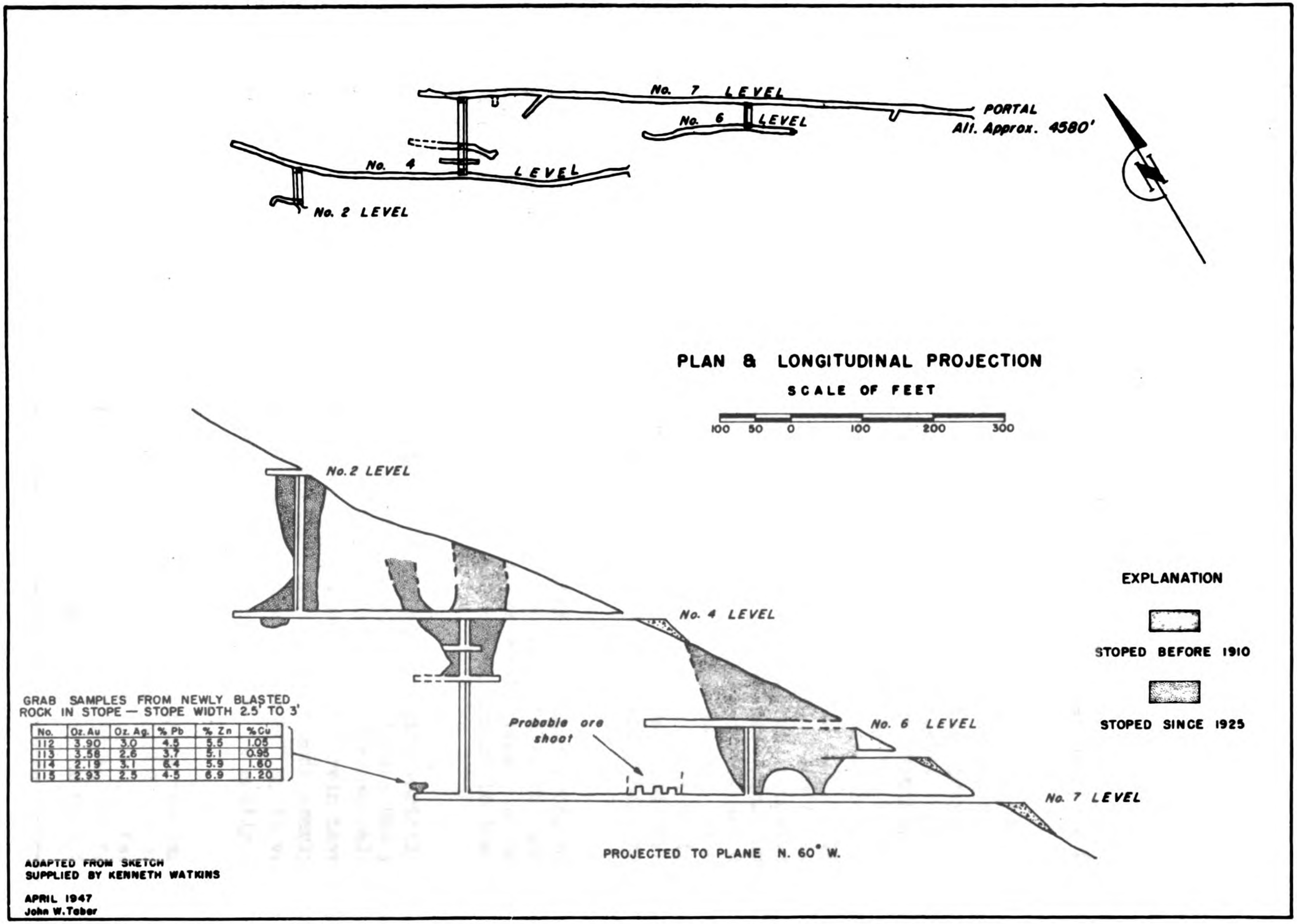

GRAB SAMPLES FROM NEWLY BLASTED ROCK IN STOPE — STOPE WIDTH 2.5' TO 3'

No.	Oz. Au	Oz. Ag.	% Pb	% Zn	% Cu
112	3.90	3.0	4.5	5.5	1.05
113	3.58	2.6	3.7	5.1	0.95
114	2.19	3.1	6.4	5.9	1.60
115	2.93	2.5	4.5	6.9	1.20

Figure 5. - Helena mine, Bohemia district, Lane County, Oreg.

mine. The exhaustion of the free-milling oxidized ores marked the end of boom-period activity. Subsequently the Musick, Helena, and Champion mines were acquired by the Oregon Securities Corp. A 30-stamp mill with gravity concentrating equipment was built on the Champion property to treat sulfide ore from the group of mines. Ore from the Musick mine was transported by an electric tram to the Evening Star adit, where it was hauled to ore passes on the 600-foot level of the Champion workings and transferred to the 900-foot haulage level. At the portal of the 900-foot level it was transferred to a cable-bucket tram and conveyed to the old Champion mill about 3,000 feet down Champion Creek gulch.

The Oregon Securities Corp. developed and operated the mine from 1902 to 1907. In 1908 the three mines were sold to the West Coast Mines Co. This company did very little work in the Musick mine but held the property until 1921, when it was purchased by L. M. Capps of Blackfoot, Idaho. Capps rebuilt the 5-stamp mill on the property and operated it for several months. Thereafter the property remained idle until 1935, when it was leased by the Minerals Exploration Co. This company built a 22-ton gravity-concentrator mill. According to the manager of the mill, it operated during 1936 and 1937 to produce concentrates that yielded a net smelter return of $101,000 and made a profit of $18,000 for the company. No developing was done in the mine; consequently, the operation was shut down after the developed reserves were mined out. In 1939 the H & H Mines Co. took a lease and option on the property and drove a new winze level, which is said to have developed new ore bodies. Plans for operation were interrupted by the war. The H & H Mines Co. sold their lease and option to Kenneth O. Watkins in 1944. Watkins, in turn, sold the contract interest to the Tar Baby Mining Co. of Salt Lake City, Utah. This company retained the interest in 1946 but did no work at the mine.

Information compiled from various sources indicates that production from the Musick mine may have been about $280,000. Measurements of the stopes indicate that the amount of rock stoped was at least 40,000 tons. At this figure the ore need only to have averaged $7 per ton to amount to the reported value of ore produced.

The Musick vein, unlike others in the district, has wide variation in strike. This is partly because of various splits in the fissure and partly because the Musick vein merges into the California vein. The over-all trend of the Musick vein is about N. 60° W. However, segments of the vein have strikes ranging from N. 45° W. to S. 85° W. The California vein trends nearly due east. The veins dip at around 75° S.; local variations are from 60° S. to vertical. According to Callaghan and Buddington,[19] the country rock is mostly light-colored rhyolite with some andesite and tuff.

Some of the ore shoots in the Musick vein have been among the largest found in the district. Three of the ore shoots have been mined for a horizontal distance of over 300 feet each and a vertical distance of over 180 feet (fig. 6). Others are mined for 75 to 100 feet horizontally and 50 to 100 feet on the dip. The stopes are 2 to 7 feet wide. The average width is about 4 feet.

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[19] Work cited in footnote 4.

Musick ore is similar to the other gold-silver-sulfide ores of the district. It is a silicious-gangue ore containing fragments of wall rocks and the usual mixture of sulfides. The gold content is somewhat lower than in other veins in the district; the lead content is higher. A sample taken by Watkins for metallurgical testing at a commercial laboratory contained 0.12 ounce Au, 2.4 ounces Ag, 0.78 percnet Cu, 9.4 percent Pb, and 3.8 percent Zn. This sample is said to represent developed ore in the mine in 1946. A grab sample of broken rock in the stopes taken by the author in 1946 contained 0.38 ounce Au, 1.7 ounce Ag, 1.2 percent Cu, 5.6 percent Pb, and 5.7 percent Zn. The sample contained some partly oxidized ore, which probably accounts for the somewhat higher gold content than is typical of Musick sulfide ore.

The Musick vein has been explored on four levels to an average depth of about 300 feet and for a horizontal distance of 1,900 feet (fig. 6). There are about 6,500 feet of drifts and crosscuts. About 1,700 feet of the horizontal distance explored is on the Musick vein. The remaining 200 feet is on the west end of the vein, where the California and Musick veins have merged. This section of the vein is considerably wider (8 to 12 feet) than the main Musick vein but contains less ore mineralization. Only one small stope has been opened on the merged California-Musick vein. At the surface the Musick vein has been traced by pits and outcrops a distance of 2,000 feet. The California vein has been similarly traced a distance of 1,500 feet to the point where it joins at a low angle with the Musick vein.

Most of the workings were open in 1946. Part of the No. 2 level had been mined through from below and was not readily accessible. The No. 4 level was blocked near the portal by a local cave but could be reached by raises from the No. 6 level. The latter was accessible throughout. The winze level, the most recent development, was filled with water in 1946.

All of the early mining was done by open stopes with a minimum of stull timbering installed primarily to facilitate mining in the stopes. Stopes mined 40 or more years earlier were in remarkably good condition in 1946. Only those near the surface had caved to any great extent. The most recent mining was done by shrinkage stoping. According to Watkins, who supervised most of this work, shrinkage stoping proved satisfactory for the sulfide ore bodies. The only timber used was for chutes and raises, with a few sets to support stope fill and local soft spots in the tunnel back.

All equipment except track had been removed from the mine. At the surface the track from the haulage level is partly covered with a steel snow shed. There is a small mill building and a coarse-ore bin of about 50 tons capacity.

The camp consists of a 30-man bunkhouse, a cookhouse, and four dwelling houses. The buildings are in fair condition. The camp water supply is dependent on a small intermittently flowing stream. Mine water would probably have to be used to supplement the stream supply for milling purposes.

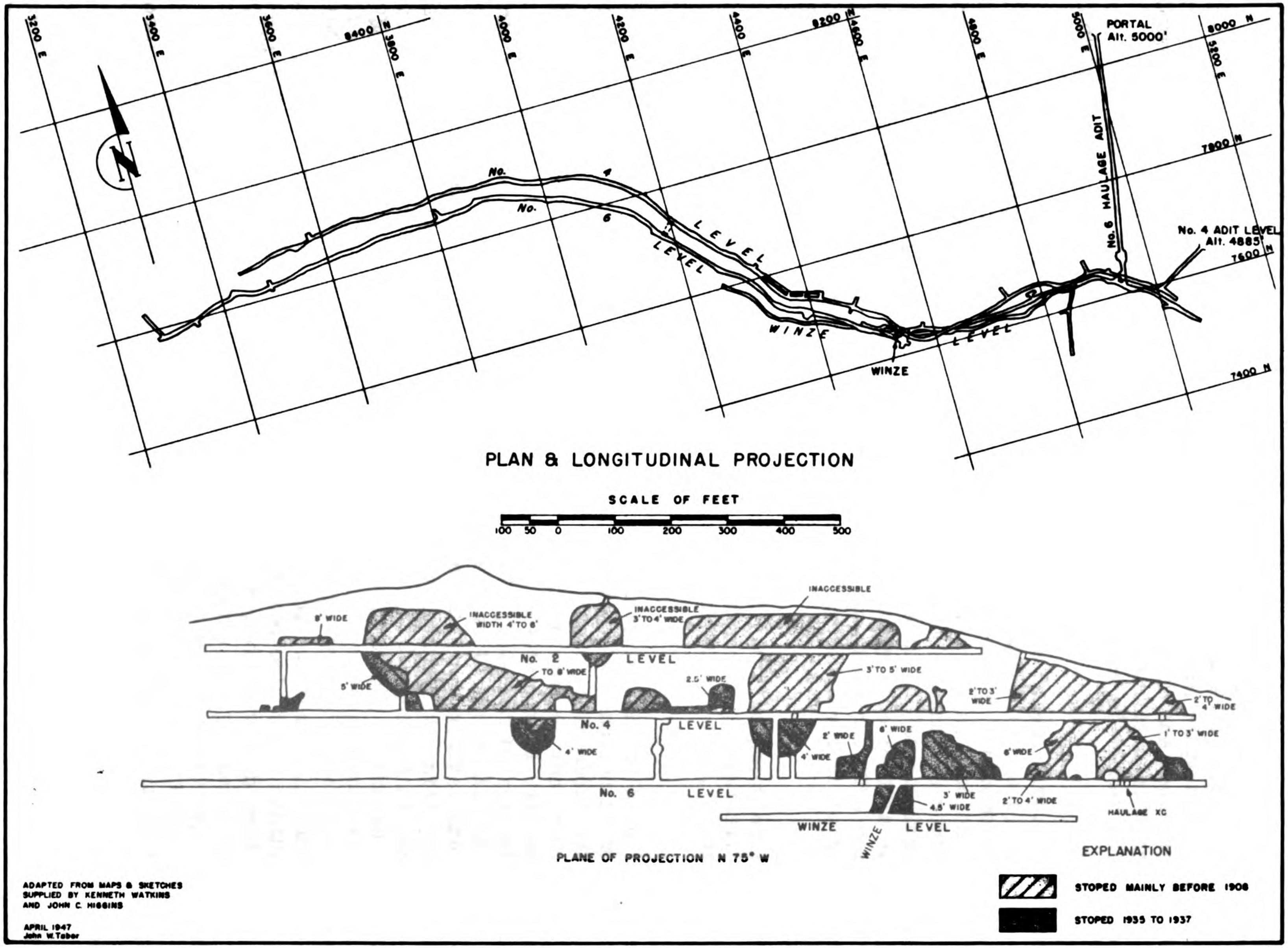

Figure 6. - Musick mine, Lane County, Oreg.

Noonday (Annie) Mine

This mine, one of the oldest producers in the district, is situated near the summit of Grouse Mountain in sec. 18, T. 23 S., R. 2 E., W.M. (fig. 2). Grouse Mountain is a prominent high point along the main ridge dividing the Champion Creek and City Creek drainages. The mine is on the southeast slope of the mountain at an altitude of 5,100 feet. At this altitude, near the summit of the mountain, there is only a scattered stand of timber interrupted by rocky brush-covered slide areas.

The mine is about half a mile southerly from the Helena mine. From the Champion mine camp it is reached by the main road, which is steep, to the Champion saddle, thence mostly level along the ridge over the same route as the Helena mine. A short side road departs from the Helena road on the northwest slope of Grouse Mountain. The side road skirts around the north and east sides of the mountain on a nearly level grade to the mine. The distance from the Champion mine to the junction of the Noonday side road is about 1-3/4 miles; it is about half a mile on the side road to the mine. The road from the Champion is usually blocked by snow from about mid-November to the first of June.

The Noonday group consists of one unpatented and five patented lode claims. These are owned by John C. Higgins of the H & H Mines Co., Portland, Oreg. The Silver Shield Mining & Milling Co. of Salt Lake City, Utah, holds a lease and option to purchase the property.

The Noonday, originally called the Annie mine, is said to have been the second mine in the district to produce. In 1887 ore was hauled from the Noonday mine to the small stamp mill on the old Knott claim about 1/2 mile distant. In 1891 a 5-stamp mill was built at the portal of the 300 level. This operated until 1898. The following year a 20-stamp mill with eight Frue vanners was built on Horseheaven Creek. A 3,000-foot bucket-cable tram carried the ore from the 300-foot level of the mine to the mill. The mill operated for a year and shut down when the free milling oxidized ore was exhausted. Thereafter the mine appears to have been inactive until 1914, when A. W. Halliwell and John Coffman purchased it. In the succeeding years to 1932, Halliwell and Coffman made a few small intermittent shipments of select direct-shipping ore. Watkins[20] states that this ore had a gross value of $160 to $300 per ton. In 1934 the Grouse Mountain Mining Co. obtained a lease and option to purchase the property. This company built a small flotation mill, the first in the district. The mill operated only a few months. In 1936 and 1937 Watkins mined a small amount of ore, which was shipped to the smelter without concentration. In 1939 the property was purchased by the H & H Mines Co. This company did some development work preparatory to running the mill at the Champion mine. No ore was mined from 1939 to 1946. Various local sources credit the Noonday mine with a total production of from $90,000 to $150,000. Measurements of the stopes, based largely on old stope-map data, indicate that about 7,000 tons have been mined. Assuming an over-all average recovered value of $15 per ton, it would seem that total production of the

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[20] Work cited in footnote 12.

Noonday mine could have been around $100,000. Recorded production for the Noonday mine is shown in table 6.

TABLE 6. - Metal production of the Noonday mine, Lane County, Oreg. (From data supplied by Alfred L. Ransome)[21]

Year	Crude ore, tons	Gold, ounces	Silver, ounces	Copper, pounds	Lead, pounds	Zinc, pounds
1891.......		484				
1892.......		798	284			
1893.......		1,548				
1894.......		750				
1895.......		48				
1896.......		968				
1897-1917..	No record					
1918.......	13	46	59			
1919-1928..	No record					
1929.......	15	7	6			
1930-1931..	No record					
1932.......	15	66	106	179	1,433	
1933-1934..	No record					
1935.......	900	361	1,298	6,718	14,929	
1936.......	150	41	99	635	957	
1937.......	380	66	235	2,650	2,330	
1938-1945..	No production					

The Noonday claims include three veins - the Henry, Annie, and Maggie. These are roughly parallel and about 400 feet apart. All of the veins have been prospected on the surface by trenches and pits. Each has been traced for 1,000 feet or more. The Annie vein, which is about midway between the other two veins, has been traced for about 1,500 feet on the surface. Most of the Noonday workings are on the Annie vein. Except for a small amount of ore taken from a shallow shaft on the Maggie vein, the Noonday production has come from the Annie vein.

The Noonday veins follow closely the pattern of structure and ore mineralization of the other base-metal gold veins in the district. The trend of the group is No. 60° W.; the dips are generally southeasterly at high angles, although locally in the Annie vein the dip is vertical to 75° northwesterly. According to Callaghan and Buddington,[22] the wall rock is labradorite andesite. They also describe a small plug of dacite porphyry, which outcrops several hundred feet north of the west end of the Annie vein. The ore shoots are scattered lenticular bodies such as are characteristic of the district. One shoot has been stoped for a horizontal distance of 170 feet and mined to a depth of 300 feet below the surface (fig. 7). Another shoot has been mined 120 feet horizontally on the No. 2 level and stoped a distance of 110 feet to the surface. The ore shoots have been stoped 3 to 8 feet wide; they average about 5 feet. It has been reported that 1-1/2 to 2 feet of this was often high-grade ore running to several hundred dollars per ton. Most of the ore mined in the Annie, as well as the Maggie, veins has been oxidized ore. Watkins[23] states that in the winze level, 400 feet below the surface, zinc and lead sulfides increased in quantity. Callaghan and Buddington[24] report that in 1917 and 1918, 13 tons of sorted ore containing abundant sulfides and some leached material from an intermediate level between levels 2 and 3 yielded an average of 5.54 ounces gold and 7.7 ounces silver per ton.

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[21] Supervising engineer, Western Region, Metal Economics Division, Bureau of Mines.

[22] Work cited in footnote 4.

In 1939, the H & H Mines Co. sampled the mine in connection with their combined operations development program. Twenty-five samples taken from various drifts and raises on the Annie vein had an average width of 35 inches and a weighted average gold assay of 0.358 ounce per ton. Vein samples at intervals from a short drift on the Maggie vein mainly contained little more than a trace of gold with 1 to 2 ounces of silver per ton. Four samples out of 14 ran from 0.3 ounce to 1 ounce in gold. None of the samples were analyzed for other metals.

The Noonday workings consist of over 3,000 feet of drifts and crosscuts and 600 feet of raises (fig. 7). The development on the Annie vein is on three principal levels (Nos. 1, 2, and 3) and various short sublevels. No. 1 level, a shallow drift, is completely lost in caved stopes. Levels 2 and 3 are adit levels; these were open and in fair condition throughout. Winze levels at 40 and 100 feet below the No. 3 level were filled with water. The Maggie vein has been reached from the Noonday workings by a 450-foot crosscut on the No. 3 level. Altogether, only about 25 feet of drifting has been done on the Maggie vein from this crosscut. The only other opening on the Maggie vein is from an old shaft on the outcrop. The workings from the shaft probably did not amount to more than 200 feet of drifts and crosscuts. These workings were inaccessible in 1946.

Like other mines in the district, most of the early mining in the Noonday mine was done in open stopes. More recent work was done by both open stoping and shrinkage stoping. The largest stope on the Annie vein was mined to within a few feet of the surface. It had since caved throughout almost the entire length and consequently blocked off a large part of the No. 1 level. Other stopes on the Annie vein are largely open and accessible. Some of the stopes are more than 40 years old.

A small mill building near the portal of the No. 3 level is the only plant improvement left on the property. The building contains an ore bin of about 50 tons capacity. The mill building and ore bin are in poor condition. The only equipment on the property is the mine track installed in most of the main drifts and crosscuts. Some of the rails are nearly rusted out. The mine camp, several hundred feet from the portal of the No. 3 level, has a 30-man bunkhouse and cookhouse. The roofs of these buildings were crushed by heavy snowfall in recent years, but otherwise the main structures are sound.

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[23] Work cited in footnote 12.
[24] Work cited in footnote 4.

Vesuvius Mine

This mine is situated on the west slope of Fairview Mountain, about one-fourth of a mile northwest of the Musick mine. The haulage portal of the main workings is at 5,367 feet altitude. At this altitude, timber is scarce. The steep slope is partly covered with low brush and small scattered fir trees. Below 5,000 feet the hillside is more densely covered with stands of tall timber.

The mine may be reached from either of two routes. The best is by way of the Champion mine over part of the road used to reach the Musick mine. Beyond the Champion saddle, the route is the main road west along the ridge to the Musick saddle. From the Musick saddle the road is on a descending grade on the west slope of Fairview Mountain about one-fourth of a mile to the upper or principal workings of the Vesuvius mine. The total distance from the Champion mine camp is about 2.5 miles. The road to the Vesuvius mine, also known as the Sharps Creek road, is continuous from the mine down the west slope of Fairview Mountain and down Sharps Creek valley, where it ultimately joins the highway between Disston and Cottage Grove (fig. 2). In the early days the Sharps Creek road was the main access to the district. Having been little improved since the horse-and-wagon days, the road was in poor condition in 1946.

The Vesuvius group consists of 11 unpatented lode claims situated in sec. 11, T. 23 S., R. 1 E., W.M. (fig. 2). These are owned by the Vesuvius Mining Co. The several veins in the Vesuvius area were discovered some time before 1895. The Graber brothers of Cottage Grove moved the old Knott mill (5-stamps) to the mine and operated the property until 1902. They are said to have taken out high-grade gold ore from an oxidized ore body near the surface. At about this time a small vein near the Vesuvius was being worked by Stocks and Harlow. The Stocks and Harlow mine also had a 5-stamp mill, which operated for several years. In 1902 Graber brothers sold the Vesuvius property to F. J. Hard. Later, Hard organized the Vesuvius Mines Co., and the Stocks-Harlow property was acquired. A camp was built about one-fourth of a mile down the mountainside from the main Vesuvius workings. Near the campsite a new adit crosscut was started to intersect the assumed extension of the ore shoot about 570 feet below altitude of the main workings. The mill was also moved to the new site. Hard continued to drive the new adit (Wild Hog adit) intermittently throughout the years until 1923. Only a small amount of ore was taken from the Wild Hog adit. Various lessees have prospected in the old workings since 1923, but no determined effort has been made to develop and operate the Vesuvius mine since that date. Estimates of the production from the property range from $5,000 to $15,000.

Four veins are included in the Vesuvius claims. These are the Jasper, Vesuvius, Stocks-Harlow, and Story. According to Callaghan and Buddington,[25] the country rock is labradorite andesite with intercalated tuff and volcanic breccias. The Vesuvius vein has an average strike of N. 85° W. and the dip is 60° S. This vein is intersected on the north by the Jasper vein, which strikes N. 67° W. and dips 50° S. Both are strong fissure veins. The Jasper vein has been traced at the surface a distance of 2,000 feet (fig. 2). The Vesuvius vein has been traced for about 500 feet on the surface; some 1,500 feet distant,

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[25] Work cited in footnote 4.

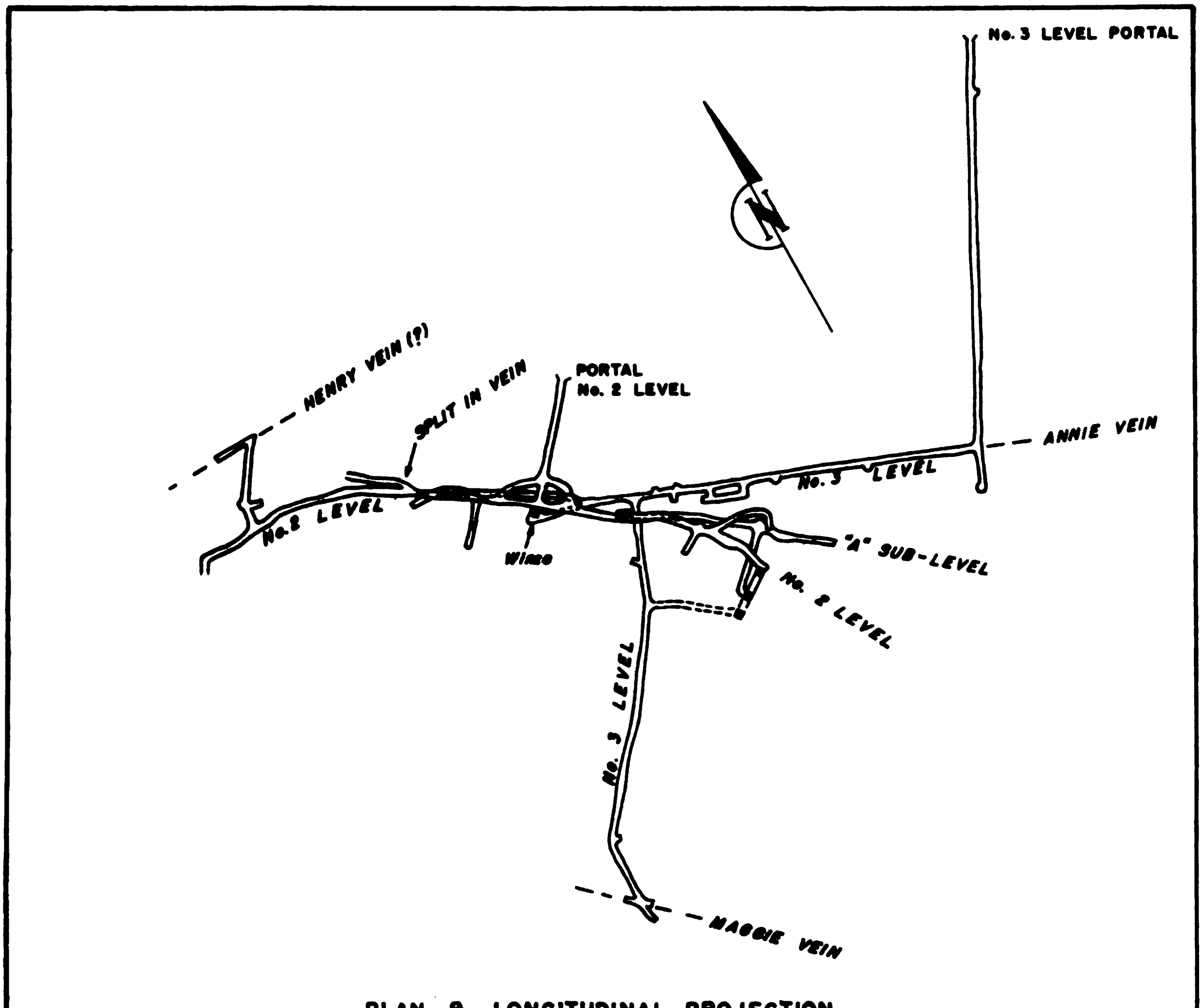

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Figure 7. - Noonday mine, Lane County, Oreg.

a segment that is also regarded as the Vesuvius vein has been exposed. The Stocks-Harlow vein lies between the Vesuvius and Jasper veins, near the latter. The strike of the Stocks-Harlow vein is N. 80° E., and the dip is about 50° S. The Story vein, about 500 feet southeast of the Jasper vein, strikes N. 56° W. and dips 70° to 75° S.

The principal stoping on the main Vesuvius workings is on the Jasper vein near its intersection with the Vesuvius vein. The largest stope is 120 feet long on the main level and 70 feet long on the level above. The stope is 3 to 5 feet wide. There are two smaller stopes on the Vesuvius vein. These are likewise near the intersection of the two veins. The Stocks-Harlow workings are also said to have been stoped.

The Vesuvius workings consist of a main level and three shorter levels above the main level (fig. 8). The main level and the first level above have, together, about 2,700 feet of drifts and crosscuts. Workings on the Jasper vein northwest of the main Vesuvius workings comprise a cut 60 feet long and an adit 60 feet lower. The adit level has 150 feet of crosscuts and 260 feet of drift. On the Stocks-Harlow vein the development is on two levels with about 300 feet of drift and 100 feet of crosscuts. The Wild Hog adit, a long prospect drift driven on the Vesuvius vein, is 567 feet below the main level of the Vesuvius workings. The Wild Hog adit consists of about 2,900 feet of drifts and crosscuts. About 1,200 feet is drift on what is regarded the Vesuvius vein. Three small stopes were started on this drift. The Wild Hog adit was driven to explore the section of the vein near the junction of the Jasper and Vesuvius veins, corresponding with the position of the ore shoot in the main Vesuvius workings. This vein junction was never reached in the Wild Hog adit, although it was believed that the Vesuvius vein was followed for 1,200 feet, and a vein regarded as the Jasper vein was picked up in a crosscut 270 feet north of the Wild Hog adit. A survey by W. W. Elmer[26] in 1927 suggested that the drift departed from the Vesuvius vein before the junction was reached, and that a crosscut started to correct the error would have to be extended between 300 and 400 feet to reach the Jasper-Vesuvius intersection.

The Wild Hog adit is believed to be open throughout most of the drift and crosscuts. However, when inspected in 1946, the adit was unsafe to enter for more than a few hundred feet because of foul air. Other workings on the property were only partly open. Most of the stopes were inaccessible. In addition to the stoping on the principal ore shoot above the main level of the Vesuvius workings there is said to have been an underhand stope that followed the ore shoot below the level. This is reported to be filled with waste rock. According to local sources, the stope followed the high-grade ore of the main shoot to about 30 feet below the level, where the grade fell off to "ordinary grade mill ore (of) about $20 value at the old price of gold." According to the usual experience in the district, this might indicate that the point had been reached where the enriched oxidized ore gave way to sulfide ore.

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[26] Mining engineer, Portland, Oreg. Unpublished examination report, June 1927.

Little is left of the old Vesuvius camp. Most of the buildings are in ruins. The mill building at the Wild Hog adit is no longer standing. Water for the camp and mill was evidently taken from a small intermittent stream a few hundred yards from the Wild Hog mill site. This supply probably was barely adequate for the 5-stamp mill.

Other Prospects

In addition to the foregoing known producers in the district there are over 60 prospects. These prospects have been explored to varying extent by nearly 200 adits. Long prospect drifts have been driven on several of them. A number of them are said to have produced small quantities of ore incidental to prospecting. This ore probably was hauled to one of the several mills described in the foregoing discussions. At least two of these prospects, the Mayflower and Crystal, had stamp mills on the property with evidence that some ore was mined and milled. Others have sulfide ore on the dumps, indicating that ore shoots were encountered. Most were driven in the boom period when oxide free-milling gold ore was sought. Prospects such as the Oregon-Colorado, which contained sulfide copper ore with little or no gold, were of little value at that time.

Most of the outlying prospects were not visited by the author. A large part of the underground exploration was inaccessible, usually because of caved portals. Nevertheless, an attempt has been made to bring together all of the factual material available on these prospects to illustrate the extent and intensity of mineralization in the district; to describe the amount and purpose of past prospecting; and particularly to preserve this information so that it will be available at such time as future prospecting or exploration may be undertaken in the district. Many of the data have been obtained from the report by Callaghan and Buddington[27/] who examined the prospects in 1930 when many of the adits were open that are no longer accessible. Other data that seemed to be essentially reliable, if not complete, have been accumulated from a variety of sources. The order of presenting the discussions of the prospects has no significance other than the amount of information that was obtained for each.

Oregon-Colorado Prospect

This group comprises eight patented claims, the property of Kenneth O. Watkins, of Disston, Oreg. The Oregon-Colorado vein is in secs. 19, 29, and 30, T. 23 S., R. 2 E., W.M. (fig. 2). It is an outlying vein on the southern margin of the district, 2-1/4 miles airline distance southeast of the Champion mine. By road, the distance from the Champion mine to the Oregon-Colorado prospect is 4.5 miles. The route is over the main ridge through Champion Saddle, thence westerly along the ridge to the Oregon-Colorado road, which begins the long descent down the south slope into City Creek gulch. The Oregon-Colorado road, slightly over 3 miles long, is a narrow wagon trail on a moderate, fairly uniform grade. In 1946 it was not passable with an automobile because of several small washouts and minor obstructions.

27/ Work cited in footnote 4.

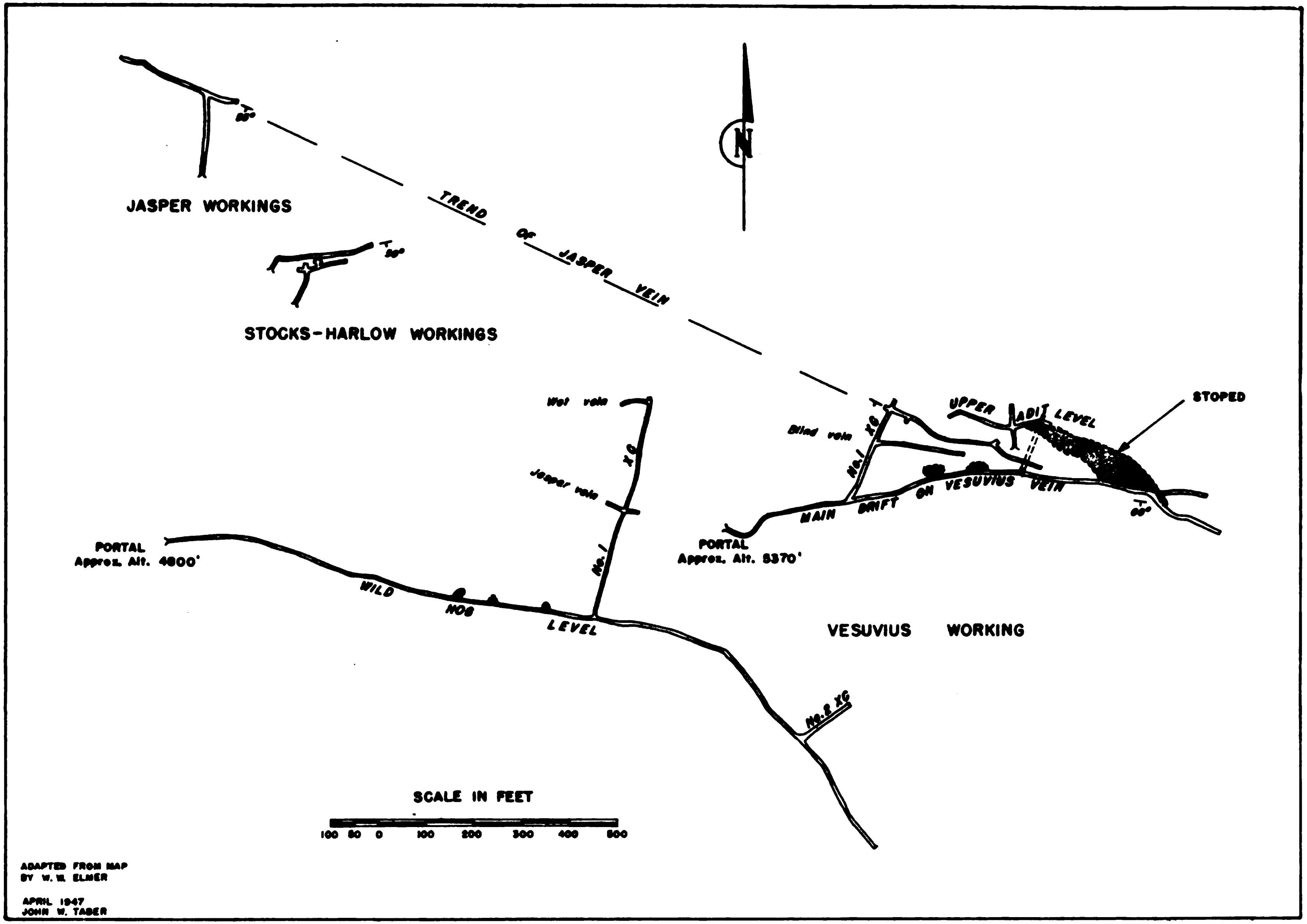

Figure 8. - Plan of Vesuvius mine and adjacent workings, Lane County, Oreg.

The Oregon-Colorado vein strikes about N. 50° W. and dips 60° to 65° southwest, following closely the trend of the principal vein system in the district. Callaghan and Buddington[28] describe the country rock as tuff, volcanic breccia, and coarse agglomerate. They also state that a very fine-grained andesite dike is exposed at the portal of the lower tunnel.

Most of the exploration on the deposit was done by the Vesuvius Mining Co. prior to 1920. The vein is explored by two "adit drifts" and several trenches through a horizontal distance of over 2,000 feet. The lower adit is at an altitude of about 3,300 feet; the upper adit is at about 3,600 feet altitude. Both are inaccessible. The lower adit is caved at the portal. The upper adit is blocked a short way in from the portal. According to Elmer[29] the lower adit is 1,800 feet long, and the upper drift is 450 feet long. Elmer also stated that in the first 1,100 feet of drift on the lower level, four shoots 50, 137, 50, and 140 feet long were encountered. Oliver Gilbertson,[30] of Cottage Grove, Oreg., stated that altogether eight ore shoots were encountered in the lower level and that these averaged about 2-1/2 feet in width. He also stated that the drift was in "hard ground" for about the first 1,000 feet, to where a short section was timbered. Gilbertson thought that, except for the caved portal, the tunnel probably would be open to this point. He stated, further, that there is no ore in the face of the lower drift.

Vein material on the dump is silicified breccia cemented by comb quartz. Vugs are common, usually with dolomite lining the interior of the cavities. The ore minerals are principally chalcopyrite and pyrite.

Callaghan and Buddington[31] state that a report on samples of the ore submitted to a flotation company in 1918 and 1920 disclosed that the samples averaged 3.69 percent copper and 4.22 ounces of silver per ton. About 200 tons of ore piled aside on the lower-level dump probably contains 2 percent or better in copper. Diller[32] states that a sample taken in the upper tunnel 60 feet from the portal contained 1 ounce of gold and 3.4 ounces of silver per ton.

There are no buildings or other outside improvements on this property. The ore removed from the mine was left on the dump. So far as can be determined, no ore was ever shipped from the property.

Sunset Prospect

Twenty unpatented claims are included in the Sunset group, which is on the northern margin of the district. These are owned by Dale Wyatt, of

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[28] Work cited in footnote 4.

[29] Work cited in footnote 26.

[30] Gilbertson did much of the exploration drifting on the lower level under contract with the Vesuvius Mining Co., and was one of the last men in the lower drift before it became inaccessible.

[31] Work cited in footnote 4.

[32] Work cited in footnore 3.

Springfield, Oreg. The claims are mainly on the north side of sec. 36, T. 22 S., R. 1 E. (fig. 2). They extend from Champion Creek eastward to the summit of Noonday ridge.

The prospect is 2-1/2 miles, airline distance, nearly due north of the Champion mine. By road it is approximately 5 miles on the main Bohemia-Disston road to what is locally known as the second covered bridge (10 miles from Disston), where the Noonday ridge road departs southeastward. From the covered bridge it is approximately 2 miles on the Noonday ridge road to the Sunset workings. The Noonday ridge road is steep and narrow but can be traveled by automobile without difficulty.

According to Watkins,[33] there are three major veins and two minor parallel veins on the claims. Callaghan and Buddington[34] recognize only one principal fracture, the Cape Horn vein, which, they say, has been proved a horizontal distance of 4,000 feet and may extend another 1,500 feet to Champion Creek on the west end. The vein has been traced by drifts and prospect pits through a vertical range of 1,000 feet.

Three principal adits have been driven on the vein. In 1936 these were sealed at the portals by slumping overburden. Callaghan and Buddington[35] describe the tunnels as follows:

> The upper tunnel is 175 feet long and lies east of the Noonday road above the switchbacks at an altitude of 4,300 feet. The vein matter consists of brecciated country rock cemented with quartz. Some pyrite occurs in fractures, but sulphides, if present, have largely been removed by weathering.
>
> A second drift 300 feet long is about 1,100 feet farther west and more than 400 feet lower. The 100 feet of drift nearest the face reveals a shoot of quartz with sulphides, the first half consisting of fractured cherty quartz with crusts of pyrite, and the remainder consisting of a band of quartz 9 inches to 2-1/4 feet wide containing moderate amounts of sphalerite, galena, and chalcopyrite and a little tetrahedrite. The sulphides are only slightly oxidized, even at the face. A sample across the vein at the face is reported to have yielded a trace of gold and silver and 10 percent of zinc.
>
> A third drift 700 feet long lies about 150 feet lower. It starts on the vein, leaves it, but reaches it again about 300 feet from the face. A shoot, presumed to be the same as that in the drift above, appears in the face of this drift. Seven feet of rather low-grade vein matter in the face consists of quartz with sulphides and altered rock. A sample 4.5 feet wide at the face is reported to have yeilded a trace of gold and silver, 7 percent of zinc, and insignificant amounts of lead and copper.

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[33] Work cited in footnote 12.
[34] Work cited in footnote 4.
[35] P. 77 of work cited in footnote 4.

According to Watkins,[36] the Burn tunnel (probably the same as the upper tunnel described above) contains oxidized ore that assays 0.20 to 0.35 ounce gold per ton across a width of 6 feet.

Riverside Prospect

This property consists of three patented claims belonging to Kenneth O. Watkins of Disston, Oreg. The claims are on Horseheaven Creek near the center of sec. 20, T. 23 S., R. 2 E. (fig. 2). The mine is 2-1/2 miles, airline distance, southeast of the Champion mine. The prospect is reached by road and trail by way of the Helena mine, a total distance of about 6 miles from the Champion mine. The first 3.3 miles to the Helena mine is a good to passable road. The continuation is an old wagon trail, which extends 2 miles to the Mayflower mine. The remainder of the distance to the prospect, about three-fourths of a mile, is over a pack trail.

The vein strikes N. 42° W. and dips at a high angle to the southwest. It has been explored by trenches and short drifts a distance of 700 feet on the surface. The main adit on the prospect, at 2,900 feet altitude, is now caved at the portal. According to various reports, this adit is said to be about 1,800 feet long. Elmer[37] reports that the adit drift is on the vein for several hundred feet and then is parallel to the vein for the remainder of the distance. According to Elmer, the parallel drift has several crosscuts that intersect the vein at intervals, showing continuity of vein matter from the portal to the face of the adit drift. It is said that the drift penetrated one ore shoot 400 feet long, which was wider than the drift. Eaton[38] also states that the vein has a greater width than the tunnel. Two samples reported by Elmer averaged 0.1 ounce gold, 2.9 ounces silver, 1.86 percent copper, 0.7 percent lead, and 6.8 percent zinc.

Vein matter on the dump is similar to other sulfide ore in the district. It consists of fragments of tuff silicified and cemented in quartz. The sulfides, chalcopyrite, pyrite, sphalerite, and galena are in veinlets and blebs in the quartz. The sulfide veinlets are also in the tuff fragments included in the vein matter. Occasional vugs in the quartz often have sulfides encrusted on the inside.

There is no record of production from the mine throughout the exploration period from 1898 to 1910. Some ore remains on the dump. It is possible that sorted ore from the exploration drifting may have been hauled to one of the several mills that were operating in the district during that period. The property has no outside improvements.

Mayflower Mine

This property comprises five patented claims on Horseheaven Creek. These belong to Cyrus Huntington of Castle Rock, Wash. The vein, situated in the northeast corner of sec. 20, T. 23 S., R. 2 E., crops out on both the east and west sides of the creek (fig. 2). The property is 5 miles from the Champion camp by way of the Helena mine. The Mayflower mine is on the route to the Riverside mine.

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[36] Work cited in footnote 12.
[37] Work cited in footnote 26.
[38] Eaton, W. M., Description of Properties of the Vesuvius Mines Co., Bohemia, Oreg.: Oregon Engineer, vol. 1, No. 1, 1909, pp. 32-37.

The development consists of four adits, two on each side of Horseheaven Creek. On the east side of the creek the adits are at altitudes of 3,120 and 3,375 feet. According to Callaghan and Buddington,[39] the upper adit is a crosscut 30 feet to the vein, which is 5 feet wide at this point. The vein is stoped a horizontal distance of 60 feet and 25 feet to the surface. The lower adit is partly caved and inaccessible.

The adits on the west side of the creek are at altitudes of about 3,240 feet and 3,370 feet. Both adit drifts are caved and inaccessible. The upper adit is stoped about 35 feet to the surface. The stope is 4 to 5 feet wide. The strike of the vein is N. 70° W., and the dip is 77° northeast.

Vein material on the dumps is fragmentary andesite and other country rock silicified and cemented in quartz. There is much pyrite and very little other sulfides. Diller[40] states that on the hanging wall of the vein there was an 8- to 12-inch band of massive lead, zinc, and copper sulfides. He reports that assays of this material yielded no gold and only 0.05 ounce silver per ton but contained 17.71 percent zinc, 11.88 percent lead, and 1.38 percent copper.

Evidently, some ore was produced, although there is no recorded production for the mine. A small cyanide mill, the first in the district, was built on the property in 1909. The old mill building and a cabin are still standing.

Crystal (Lead Cyrstal or Lizzie Bullock) Mine

Five unpatented claims comprise the Crystal group. These are owned by R. R. Shelley of Eugene, Oreg. The mine is situated in the northern part of sec. 11, T. 23 S., R. 1 E., W.M., 1 mile northwest of the Champion mine (fig. 2). It is reached by a narrow truck trail that departs from the main Champion road about three-fourths of a mile north of the Champion mine. The distance is about 2 miles by road from the Champion mine to the Crystal mine.

The Crystal vein is on a fault, which, according to Callaghan and Buddington,[41] has a throw of about 200 feet. The trend of the vein is N. 65° W., and dip is south at a high angle. The vein has been explored for over 3,000 feet by drifts and trenches. It extends westward from Crystal Basin, through Elephant Lake Basin and across the ridge between Elephant and Fairview Mountains. The old camp and main workings are in Crystal Basin. The lowest level, at 4,580 feet altitude, is an adit drift, which follows the vein a distance of 400 feet. The upper level, at 4,690 feet elevation, is a 45-foot "adit crosscut" to the vein; it is reported to have over 100 feet of drift. There are also two other short drifts on the west end of the vein - one on the east slope of the ridge above Elephant Lake and one on the west slope. Most of the underground workings are said to have been timbered. They are now largely inaccessible.

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[39] Work cited in footnote 4.
[40] Work cited in footnote 3.
[41] Work cited in footnote 4.

Watkins[42] claims that a group of 108 samples taken by him in the lower workings averaged 0.03 ounce gold, 2.0 ounces silver, and 1.1 percent copper, 2.0 percent lead, and 2.9 percent zinc. The average width is said to be 10 feet. Most of the vein material is said to be oxidized. The vein material consists of brecciated country rock (andesite and tuff) cemented with quartz and containing small amounts of sphalerite, pyrite, chalcopyrite, and galena.

The property was operated briefly in the 1890's, at which time most of the exploring was done. A 2-stamp, water-driven mill was built and operated on the property at that time. Old mint records credit the Lizzie Bullock mine with a production of $1,200 in 1895. However, the records are incomplete. There may have been some additional production.

A few old buildings are standing at the camp site, relic of the early operation. There has been no activity or improvements on the property in recent years.

Leroy Prospect

Seven patented claims in secs. 11 and 12, T. 23 S., R. 1 E., W.M., constitute the Leroy group (fig. 2). These are about half a mile north - about 1 mile by road from the Champion mine. The claims are owned by R. R. Shelley of Eugene, Oreg.

The vein has been explored by four adit drifts and several trenches. The four adit drifts comprise altogether about 1,000 feet of drifting. Callaghan and Buddington[43] state that the vein is in a dike of granodiorite porphyry that strikes northwest on the west slope of the hillside from Champion Creek. The strike of the vein is N. 60° to 70° W., and the dip is 55° to 70° southwest. The principal adit and workings are at an altitude of 3,920 feet. This level comprises a crosscut of 90 feet and 670 feet of drift. At 4,170 feet altitude, beside the road to the Crystal mine, are three short drifts on the vein. The adit to the northeast is 175 feet on the vein. The others are drifts on the vein for 25 and 50 feet.

The vein, 5 to 6 feet wide, comprises silicified fragments of andesite and tuff included in quartz. In places the vein is nearly all quartz. Sulfides are present throughout most of the vein material but not abundant.

Most of the exploration work was done for the property between 1900 and 1910. No work has been done in recent years. There is no recorded production from the prospect. The property has no outside improvements.

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[42] Work cited in footnote 12.
[43] Work cited in footnore 4.

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Stonewall Prospect

This group of five unpatented claims in secs. 8 and 9, T. 23 S., R. 2 E., W.M. (fig. 2), on the eastern edge of the mineralized district, belongs to Kenneth O. Watkins of Disston, Oreg., and T. G. Donaca of Portland, Oreg. The claims are about 2-1/4 miles east of the Champion mine. They are reached by road via the Helena mine, the Noonday ridge road, and a one-mile trail; the total distance from the Champion camp is about 4 miles.

Three veins have been explored on the prospect. The uppermost is at an altitude of about 4,100 feet. The veins trend N. 40° to 50° W. They have been explored by open cuts and two short drifts 50 and 75 feet long. The ore minerals are sphalerite, pyrite, and chalcopyrite. These occur as parallel seams and stringers of solid sulfides up to 2 inches wide.

There has been no production from the prospect. No exploring has been done on the property in recent years.

Cripple Creek Prospect

The group comprises 11 unpatented claims in secs. 13 and 24, T. 23 S., R. 1 E., W.M., on the west slope of the City Creek valley (fig. 2).

The property is only about 1 mile south of the Champion mine, but because of many switchbacks the distance, by way of the Oregon-Colorado road and a trail across City Creek valley, is approximately 4 miles.

Three veins are included in the group of claims. These are the Western, Cripple Creek, and the Lost veins. The Western vein has been prospected for 3,000 feet by six adits and several trenches. The vein strikes N. 30° to 50° W., and the dip varies from 60° NE to 60° SW. The vein is 2 to 20 feet wide. The vein material is said to contain the usual sulfides but is low-grade. There is no recorded production from this prospect.

The Cripple Creek vein strikes N. 32° W. and dips 70° to 80° NE. The vein is narrow throughout, less than 18 inches. The vein material is quartz with some disseminated sphalerite, pyrite, and chalcopyrite. The principal development is a drift at 4,500 feet altitude and two short crosscuts southeast of the drift.

The Lost vein is about midway between the Western and Cripple Creek veins near a prominent point called Pilot Rock. The strike of the vein is N. 30° to 55° E., and the dip is 60° to 70° NW. It is prospected by a drift 20 feet long at 4,750 feet altitude and a drift 200 feet long at 4,800 feet altitude. The vein is soft altered tuff with stringers of drusy quartz. The quartz contains fragments of silicified tuff and scattered sphalerite, pyrite, and chalcopyrite.

A small cabin is the only outside improvement on the property.

Cosmos (Green Rock) Prospect

This prospect, comprising 12 claims, is the most northerly prospect in the district. The claims are in sec. 25, T. 22 S., R. 1 E., W.M., about 1,000 feet north of the Sunset prospect (fig. 2). The Cosmos prospect is reached over the Noonday ridge road via the Sunset prospect. A narrow road branches from the Noonday ridge road a short distance beyond the Sunset prospect and extends to the Cosmos prospect. The distance from the Sunset prospect is about three-fourths of a mile.

The principal vein is called the Sultana. This vein has been prospected for more than 2,500 feet horizontally, by trenches, a 20-foot shaft, and two long adit drifts. The vein strikes N. 65° to 80° W. and has a dip of about 80° SW. An adit on the east end of the vein comprises 225 feet of crosscut to the vein with 300 feet of drift east and 360 feet of drift west on the vein. Callaghan and Buddington[44] state:

> The vein is mostly 3 to 4 feet wide and consists of altered rock with small shoots of quartz and sulphides. A shoot about 100 feet long in the east drift ranges from several inches to 5 feet in width at a depth of 200 feet beneath the surface. Three other smaller lenses occur in this drift. A shoot of quartz and sulphides about 150 feet long occurs in the western drift. The east end of this shoot is 40 feet beneath the surface and the vein matter is partly weathered. It becomes more leached toward the west as it approaches the surface. A short crosscut to the west drift starts about 360 feet southeast of the cabin. Leached vein matter near this crosscut is reported to contain appreciable gold.

An adit about 1,200 feet west of the east adit, at an altitude of 3,820 feet, extends 275 feet to the vein. Drifts are said to be 200 feet east and 650 feet west on the vein. Most of this level is inaccessible. A moderately mineralized, partly oxidized ore shoot 100 feet long is said to be exposed in the drift. Vein material on the dump contains crushed cherty quartz cemented and encrusted with pyrite. The vein also contains some quartz with sphalerite, galena, pyrite, chalcopyrite, and a little tetrahedrite.

Grizzly Prospect

The Grizzly group comprises three claims in the NE-1/4, sec. 12, T. 23 S., R. 2 E., W.M., on the west slope overlooking Champion Creek (fig. 2). The prospect is reached by a half-mile trail, which departs from the main Champion road about 1-1/2 miles below the Champion mine.

The vein has been prospected by three adits and several trenches for a horizontal distance of 2,000 feet and through a vertical range of 600 feet. The vein trends N. 60° W.; the average dip is about 60° SW. The adits, at about 3,975, 4,125, and 4,475 feet altitude, are respectively, 200, 400, and 90 feet long. The vein explored by these drifts ranges from 1 to 6 feet in width; the widest widths are in the upper drifts. The vein material is is quartz with a trace to moderate amounts of sulfides, particularly sphalerite. The quartz contains some inclusions of fragmentary andesite.

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[44] Work cited in footnote 4.

Cabins are the only outside improvement on the property.

War Eagle Prospect

This group consists of seven claims on the south slope of Champion ridge near the head of City Creek. The claims cover most of the ground between the Champion and Musick properties. They are situated in secs. 13 and 14, T. 23 S., R. 1 E., W.M. (fig. 2). The prospects can be reached by either the Musick or the Oregon-Colorado roads by way of the Champion Saddle road. The distance is about 1 mile from the Champion mine.

The vein structures consist of two principal veins, the War Eagle No. 1 and the War Eagle No. 2, which intersect at a low angle. There is also a cross vein that intersects the east limb of each of the two principal veins. The War Eagle No. 1 vein trends No. 60° W. and dips 80° wouthwest. The War Eagle No. 2 vein trends N. 75° W. and is nearly vertical. The cross vein strikes about N. 15° E.

The main prospect adit on the claims is at 4,470 feet near the bed of City Creek. The adit is reported to be a 600-foot crosscut at N. 10° E. At 300 feet from the portal, the crosscut is said to have penetrated the intersection of War Eagle veins Nos. 1 and 2. It is reported that from the intersection there is a drift 120 feet east and a drift 150 feet west on the No. 1 vein. The vein is said to be 3 feet of quartz in the east face and 4 feet of quartz in the west face of the drift. The vein material is brecciated andesite cemented with vuggy quartz. The quartz contains seams and disseminated sphalerite, pyrite, galena, and chalcopyrite. An ore shoot at the intersection of the veins is described to be 50 feet long and to contain moderate amounts of sulfides. The No. 1 vein is prospected at the surface by pits and short adits for about 2,500 feet.

The War Eagle No. 2 vein has been prospected by trenches and short adits for about 2,000 feet east of the main crosscut. In several of the trenches 2 to 8 feet of vein matter is exposed. The vein material is similar to that of the No. 1 vein. The No. 2 vein has been regarded by several observers to be an extension of the California vein, which has been prospected on the Musick property. The strike is about the same and the alinement is about right, but no outcrop has been found in a distance of over 1,000 feet between the veins.

The cross vein crops out on the Oregon-Colorado road. The outcrop consists of diorite porphyry breccia cemented by interlaced quartz veinlets. The vein material is made up of thin-layered comb quartz, drusy sulfides, and specularite. One outcrop reveals 3 to 4 feet of vein material.

Mystery and Alpharetta Claims

These claims are in the east-central and east parts of sec. 14, T. 23 S., R. 1 E., W.M., about three-fourths of a mile southeast of the Musick mine (fig. 2). They are reached by a trail from the Musick mine.

The Mystery vein is prospected by trenches, a shallow shaft, and a short crosscut adit. The vein strikes N. 75° W. and dips 80° S. The vein is reported to be a band of quartz 1-1/2 feet wide containing disseminated specularite and a little chalcopyrite, sphalerite, galena, and pyrite.

The Alpharetta vein has been prospected by two drifts at altitudes of 4,310 and 4,410 feet. The vein trends N. 55° W. and dips 50° to 70° SW. The lower drift follows the vein about 175 feet, exposing a quartz vein said to be 8 inches to 3 feet wide. The quartz is reported to contain only a small amount of specularite, sphalerite, chalcopyrite, pyrite, and galena. The upper drift follows the vein at N. 65° to 80° W. for 100 feet. A seam of quartz is said to be exposed at the face of the drift.

Ophir Prospect

The Ophir vein is situated on the east slope of Bohemia Mountain in sec. 14, T. 23 S., R. 1 E., W.M., at an altitude of about 5,050 feet (fig. 2). It is about 1,000 feet south of the Musick vein. The prospect is reached by a half-mile trail from the Musick mine camp. The Ophir vein, trending N. 20° W. and dipping at 70° W., has been prospected for more than 1,500 feet by three adits and several trenches. The adits consist of a drift 90 feet long, a crosscut 25 feet to the vein with a drift 165 feet long, and a drift 125 feet long. The vein material is altered andesite and tuff. In some places there are quartz lenses from a few inches up to 5 feet wide. The quartz contains some sulfides, principally pyrite, with a few seams of galena, sphalerite, and a little chalcopyrite.

Orofino Prospect

The Orofino claims are in the northern part of sec. 36, T. 22 S., R. 1 E., W.M., about 1,000 feet south of the Sunset-Cape Horn vein (fig. 2). The Orofino prospect is reached by a short trail from the Noonday ridge road. A vein has been prospected by an adit-drift 50 feet long in the bed of a gulch. The drift is at an altitude of 3,620 feet. The vein strikes S. 30° E. Vein matter on the dump is reported to be chiefly cherty quartz with crusts of pyrite along fractures and a few seams of quartz with sphalerite, chalcopyrite, and pyrite.

Another vein is exposed by a cut at 3,900 feet altitude. This vein strikes N. 50° W. The vein material is comb quartz with specularite and a little chalcopyrite.

Reed and Fletcher Prospect

This prospect is on the west slope of Grizzly Mountain about midway between the Champion mine and the west end of the Helena vein. There are six claims in the group, located in sec. 12, T. 23 S., R. 1 E., W.M., and sec. 18, T. 23 S., R. 2 E., W.M. (fig. 2). The prospect is reached by a trail one-fourth mile long, which departs from the Champion Saddle road at the first switchback above the Champion mill.

The prospect has been explored by numerous pits and adits, most of which are inaccessible or otherwise concealed by caved overburden. There are adits at 4,890 and 5,000 feet altitude. The lower of these trends S. 60° E. at the portal; it is inaccessible. The upper adit is said to be more than 200 feet long; it is also largely inaccessible. The drift runs southeasterly. The dump contains some quartz.

To the northwest, at an altitude of 4,350 feet, an inaccessible drift trends S. 65° E. near the portal. The dump contains vuggy quartz, with included fragments of country rock, moderate amounts of sphalerite, and a little chalcopyrite.

Shotgun Prospect

This prospect is about 1,500 feet southeast of the old Crystal mine camp, principally in the eastern part of sec. 11, T. 23 S., R. 1 E., W.M. (fig. 2). The vein, striking generally N. 50° W., and dipping from vertical to 80° N., crosses the nose of a ridge extending northeast from Fairview peak. Four short drifts and numerous pits and trenches have proved the vein through a horizontal distance of 1,000 feet. The lowest adit, at an altitude of 4,750 feet, is inaccessible. At about 4,825 feet altitude there is a drift 30 feet on the vein with 4 feet of quartz in the face. At about 4,875 feet altitude a third drift on the vein is over 100 feet long. A fourth adit, at an altitude of about 4,950 feet, is nearly 200 feet long. This drift has at least 5 feet of quartz in the face. The uppermost adit is in 80 feet on the vein. Partly oxidized vein matter is exposed the entire length of the drift. All of the drifts expose ore shoots of quartz, with included fragments of andesite and moderate to large amounts of sphalerite, galena, and chalcopyrite. Vein material in the upper workings is partly oxidized. In the lower drifts fresh sulfides are exposed.

Syndicate Claims

This group consists of 12 claims on the west side of Horseheaven Creek valley in secs. 17 and 18, T. 23 S., R. 2 E., W.M. (fig. 2). The claims are on the east slope of Horseheaven Creek valley and about half a mile west of the Noonday mine. Several veins are prospected on the claims. The northernmost is the Paymaster vein, which strikes about due east across the Mayflower trail. An adit beginning on the trail at an altitude of a bout 4,040 feet is driven 85 feet on the vein at N. 85° W. The vein matter is a narrow band of altered rock with thin seams of sulfides. At an altitude of about 3,940 feet there is a lower adit, which is inaccessible. A second vein about 1,000 feet south, at 4,275 feet altitude, is prospected by three adits and several trenches. The vein strikes N. 85° to 90° W. and dips 75° to 80° NE. The vein matter is said to consist of a wide band of white altered and silicified rock containing lenses and seams of quartz. The drusy gray quartz contains fragments of pyritized country rock with a little sphalerite. The vein is explored by an adit-crosscut at about 4,480 and 4,525 feet altitudes. About 1,000 feet west at an altitude of about 4,800 feet, a third adit follows the vein 100 feet at N. 82° W. About midway between the two above-described veins there is a third vein trending N. 77° W. This vein is prospected by an adit-drift said to be 150 feet long.

Star Prospect

The Star prospect is situated on the east slope of Fairview Mountain in the southeastern part of sec. 11, T. 23 S., R. 1 E., W.M. (fig. 2). Two veins have been prospected. At 4,700 feet altitude a drift is driven on the southern vein a distance of 120 feet. The face of this drift is said to expose a band of partly leached vein matter 3 feet wide. Another drift follows a narrow vein for 175 feet. This vein strikes about S. 75° W., and dips 60° SE.

Peekaboo Prospects

These claims are in the southeastern part of sec. 14 and the northeastern part of sec. 23, T. 23 S., R. 1 E., W.M. (fig. 2). The prospect is about three-fourths of a mile south of the Musick mine. By the trail that leads to the prospect, the distance is nearly 1 mile. Four veins have been prospected on the claims. These are the southern extension of the Phir, the Peekaboo, the Tipperary, and one other vein.

The Peekaboo vein strikes N. 20° E. on the south end and N. 45° E. at the north end. The dip is about 65° NW. On the west slope of the ridge, an adit, at 5,100 feet altitude, follows the vein about 175 feet. The vein, which is said to be 2 feet wide at the Portal, pinches to a few inches at the face. It contains vuggy quartz with a little chalcopyrite and a small amount of pyrite, sphalerite, and galena. The Tipperary vein strikes N. 48° E. and dips 70° SE. It is said to intersect the Ophir vein. The Tipperary vein is prospected by several shallow trenches; one, at an altitude of 4,810 feet, reveals up to 18 inches of quartz with chalcopyrite, sphalerite, and a little galena. A vein southwest of the cabin strikes N. 50° to 55° W. and dips 80° SW. This vein has been prospected by several trenches and a drift. The drift, at an altitude of 4,840 feet, follows a narrow quartz vein for 75 feet.

Tall Timber and Rattlesnake Prospects

These prospects are situated about 1 mile airline distance southwest of the Musick mine in sec. 22, T. 23 S., R. 1 E., W.M. (fig. 2). They are reached by the Bohemia trail a distance of 2 miles from the Musick mine. On the Tall Timber claims a drift, at an altitude of about 4,620 feet, follows a quartz vein 25 feet. The vein contains pyrite and large crystals of stibnite. Below the trail, at an altitude of 4,500 feet, pits reveal vuggy, cherty quartz with radiating fans of large stibnite crystals and small fragments of altered andesite. At an altitude of 4,570 feet, an adit follows a vein of brecciated andesite. This vein contains seams of quartz and moderate amounts of sphalerite, chalcopyrite, galena, and pyrite.

The Rattlesnake vein, trending N. 70° E., is developed by a drift 100 feet and short crosscuts. There are also two parallel drifts, each 50 feet long. The vein matter is said to be about 20 feet wide. It is reported to consist of stringers of quartz and massive veins with included fragments of country rock. The quartz contains a little chalcopyrite and sphalerite.

Yellow Jacket (Sunset) Prospect

This vein is in City Creek valley near the center of sec. 13, T. 23 S., R. 1 E., W.M. (fig. 2). It has been prospected by drifts and trenches for a horizontal distance of 1,500 feet. The vein trends N. 70° W., and dips at 65° SW. About one-fourth of a mile east of the road, at 4,770 feet altitude, an adit-drift explores the vein a distance of 125 feet. The vein, containing quartz with a little galena, sparse sphalerite and pyrite, averages a little over a foot in width throughout the drift. The prospect is readily accessible by way of the Oregon-Colorado road. It is about 2 miles by road from the Champion mine.

Ingham Group

This group consists of 10 patented claims on the south slope of Grouse Mountain, one-half mile south of the Noonday mine. The claims are in sec. 13, T. 23 S., R. 1 E., W.M. (fig. 2). They are reached by an old wagon road from the Noonday mine road.

Four veins are prospected on the claims. The Great Falls vein, striking N. 60° W. and dipping 70° SW, has a 60-foot drift, which exposes 1-1/2 feet of altered andesite with narrow stringers of quartz. The Sunset vein is about 200 feet north of the Great Falls vein and roughly parallel to it. The Sunset vein strikes generally N. 60° W. and dips south at a high angle. The vein has been prospected by two adits and several trenches. At 4,700 feet altitude a short adit-crosscut reaches the vein and extends 30 feet along it. A second short adit, which is caved, is at 4,900 feet altitude. The vein material is similar to that of the Great Falls vein. The width of the vein is uncertain; alteration is locally up to 10 feet wide. The Gold Dollar vein, trending N. 85° W., is prospected by a shaft at about 4,725 feet altitude and by several trenches. There is also a 225-foot crosscut adit at 4,600 feet altitude that does not reach the vein.

On the McCrum claim, a vein has been prospected by two adits. The lower of these is 5,475 feet in altitude. The lower adit is said to comprise a crosscut 110 feet long and a short drift on the vein. The vein strikes N. 75° E. and dips 80° NW. Vein material along the drift is soft, altered andesite.

North Fairview Claims

This group consists of 12 unpatented claims located principally in sec. 11, T. 23 S., R. 1 E., W.M. (fig. 2). The vein trends due west across the ridge between Fairview Peak and North Fairview Mountain. It dips at around 70° S. Exploration on the vein consists of a drift tunnel through the top of the ridge and two short adit drifts. The vein is reported to be 12 feet of altered andesite conglomerate with stringers of quartz. It is said to be oxidized in the tunnel 200 feet below the ridge surface. A small amount of sulfides are evident in the dump material.

Three other veins on the Fairview claims are prospected by short adits. One near an old cabin, at an altitude of 4,960 feet, follows a vein a short distance at a S. 70° W. strike. The vein, consisting of quartz and altered rock, dips 45° SE. A second vein, striking S. 85° E. and dipping 60° SW., is situated west of the west end of the main tunnel. A 50-foot drift follows vein matter consisting of quartz, pyrite, and altered andesite. Another vein strikes nearly due west and dips 80° S. Trenches and short adits reveal the vein, which contains quartz lenses up to 2 feet wide, with included fragments of country rock and some sulfides.

Glenwood Prospect

This prospect is 2 miles by the Bohemia trail southwest of the Musick mine. It is situated in sec. 22, T. 23 S., R. 1 E., W.M. (fig. 2). The vein, striking N. 60° W. and dipping nearly vertical, is prospected by a 30-foot drift near the main trail and two other drifts. Both of the latter are caved. The vein is said to consist of a wide altered zone in andesite, with lenticular quartz veins and a trace of sulfides.

Gem, Rico, and Slide Claims

These are patented claims on the west slope of Fairview Mountain. They are situated in sec. 11, T. 23 S., R. 1 E., W.M. (fig. 2). On the Gem claim, near the Adams Mountain trail, a 100-foot adit follows a narrow quartz vein in tuff. The vein trends N. 62° E. On the other claims prospect pits and trenches reveal altered rock and quartz stringers.

Gold Cross Prospect

This prospect is on two patented claims, the Gold Cross and the Bohemia Girl. The claims are situated on Grouse Mountain in sec. 19, T. 23 S., R. 2 E., W.M. (fig. 2). They are reached by a short trail south of the Noonday mine. The vein, striking N. 60° W., is explored by an adit and numerous cuts. All are caved.

Golden Slipper Prospect

This prospect is on the east slope of Horseheaven Creek Valley between the Mayflower and Riverside veins. The prospect is situated in sec. 20, T. 23 S., R. 2 E., W.M. (fig. 2). The vein strikes from S. 80° W. to N. 80° W., and dips 80° southerly. An adit drift from trail level extends over 400 feet on the vein. The vein is an altered zone in andesite with quartz. Both the quartz and the altered zone contain pyrite. The drift is accessible throughout.

Gray Eagle and Alice Claims

These are two patented claims on the south slope of Grouse Mountain about half a mile by trail from the Noonday mine. The claims are in sec. 18, T. 23 S., R. 2 E., W.M. (fig. 2). The vein strikes N. 50° W. across both claims and in the direction of the Knott shafts. The vein, which dips 65° southwest, has been explored on the Alice claim by a 50-foot drift at an altitude of

5,140 feet. On the Gray Eagle claim, two adits have been driven on a vein that is probably the southeastern extension of the vein on the Alice claim. The easterly adit, at 4,810 feet altitude, follows the vein 75 feet. The westerly adit follows the vein 125 feet. The vein material is principally altered andesite with occasional small stringers of quartz.

President (El Capitan or Churchill) Prospect

This prospect is situated in the east-central part of sec. 23, T. 23 S., R. 1 E., W.M. (fig. 2). The El Capitan vein trends N. 60° W. and dips 80° southwest. It has been prospected by a 30-foot adit at about 3,800 feet altitude on the northwest slope of St. Peters Creek. The vein is said to be 2 feet wide in the drift and to contain a 9-inch streak of quartz with calcite and sulfides. The sulfides, in order of abundance, are galena, sphalerite, and chalcopyrite. Stibnite is also said to have been found in the vein.

A 2-stamp mill was reported on the property in 1930. However, there is no record of production from the prospect.